OCT 13 1924

Electrical World

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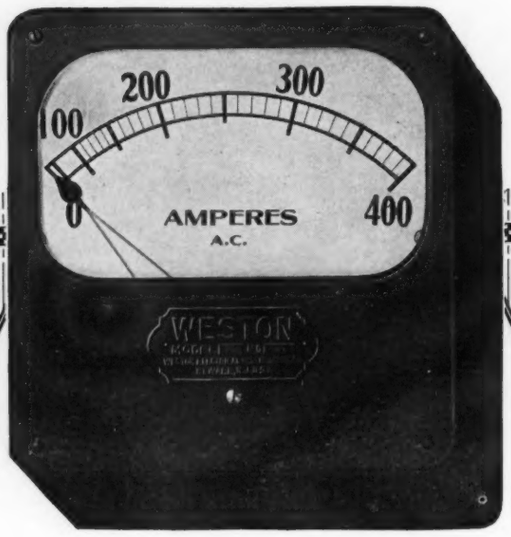

Looking for a Seasoned Investment

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WESTON

STANDARD - The World Over

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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W. H. ONKEN, JR. Editor — HAROLD V. BOZELL Editor

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More than Two Million New Customers Last Year

IT WOULD seem that in due course of time the central-station industry will cease to set new records in rapidity of growth. But the report of new customers added to the lines last year, as given elsewhere in this issue, indicates that that time has not yet arrived. A total of 2,185,377 new customers of all classes were taken on during 1923. which shows a growth over 1922 of 17.7 per cent. Such a growth far outstrips the far-heralded sales of automobiles for the year, but still leaves the central-station industry with fewer customers than there are automobile owners, even though at the opening of 1924 a total of 14,520,097 customers were enjoying the benefits to be derived from the use of electrical energy.

The growth was not confined to any one section of the country, California leading in total increase, but Pennsylvania being first in new domestic lighting customers. In other words, expansion in the industry has been general and is to be found reflected in the record new utility financing during the present year, which it seems certain will approach a billion and a half, including local sales. Such a stupendous growth called for immediate addition of equipment all along the line, from generators to distribution lines, and the record bond and stock sales being recorded monthly point to the realization in 1924 of the greatest expansion in the history of the industry.

Economic prognostications of future loads, moreover, fail to take into account the advances that will be made in science and engineering for rendering electric service still more useful to civilization. The saturation point is far in the future.

Borrowing to Buy Utility Securities

SO VITALLY important is the extension of popular ownership of public utility securities at this time that a few words about borrowing money on collateral for this purpose may be helpful to workers within the electrical industry who may not realize that good investments in seasoned stocks of growing central-station companies can be made in this way. Of course, this method is equally available to others. A great many people have a horror of "being in debt" and so put off purchases of securities until they can be paid for entire, with the result that a profitable investment in the electric utility field is deferred and perhaps never made because the savings are ultimately devoted to some other use or left to draw a comparatively low rate of interest in the bank. There is a vast difference, however, between owing money for an investment in a security which more than pays the cost of borrowing while the purchaser is reducing the sum loaned him and owing money for an investment in an article which pays no cash dividends.

In the former case the borrowed sum can be liquidated at any time by the sale of the security purchased unless its market value has fallen below the reserve required by the lender, and this risk is not a serious one if the borrower is conservative about the extent to which he uses up his collateral in purchasing. A talk with local bankers or utility managers will open the eyes of many a man and woman who has saved a little money and who can put aside something regularly to build an income from such securities which will help to pay for them while the principal sum borrowed is being gradually paid back. As the securities are paid for, these in turn can be conservatively used in further borrowing to buy seasoned issues with dual benefit to the industry and its prospering customer owners.

Public Utility Men Should Help Preserve American Institutions

WE AMERICANS pride ourselves that we have built a country which has become the envy of almost every other country in the world from the standpoint of the scale of living, the material prosperity, the organization of society and the opportunity of the individual. Our advance to this enviable position has been due entirely to the early adoption of the fundamental principle of individual initiative and individual responsibility and reward. Based upon this principle, we have created institutions in our government and in our business and industry which have made possible the happiest and most prosperous of modern civilizations. Public utility men fully appreciate these facts, for in no place is there greater evidence than in the great utility services of the country that these policies have been responsible for the development we have witnessed. Yet there is no doubt that one of the principal issues at stake in the present political campaign and coming election is whether these institutions shall be maintained—in fact, whether our fundamental economic policy shall be maintained. And there is also no doubt that many of the voters of this nation will go to the polls ignorant of the actual principles involved.

At the recent World Power Conference J. P. Noonan, president of the International Brotherhood of Electrical Workers and representing the American Federation of Labor, said labor should learn from the leaders of the power industry what to do to remove any shackles which may hamper the power industry in its proper and early complete development. This constitutes an invitation and implies a duty. And in the problem now confronting all citizens there is thus a real opportunity for utility executives to be of service to the nation, to the utility industry, to other industries, and to the men and women in our industry who have to vote. Execu-

tives can discharge this responsibility by seeing that those in their own companies are informed of the principles at stake this fall and of the real nature of the economic questions involved. Some fear that there will be an unpleasant taint of "politics" in such activity. To those it should be said that politics is none other than the biggest business of all, the business of all of us, and that those most experienced in the problems and accomplishments of our present institutions are most able to talk about them and for the benefit of others are in fact under most obligation to do so.

One Hundred Thousand Volts Direct Current

MUCH interest was aroused among Americans and others by the "transverter" on exhibit at the British Empire Exposition at Wembley. This is a new machine for transformation between relatively low-voltage alternating current and high-voltage direct current. Descriptions of the new machine have appeared in the English technical press (see ELECTRICAL WORLD, July 5, 1924), but no actual performance tests of the machine and its sister (to reverse the operation) have so far been made. Briefly, the machine consists of ten series-connected synchronous commutators, each commutator being supplied from a symmetrical thirty-six-phase system. These polyphase systems are supplied from a single group of three-phase transformers, the various phase voltages being induced in coils on cores the phases of whose fluxes depend on primary windings, with varying numbers of turns, connected to one or two of the three phases of the supply. The commutators are stationary, the brushes alone rotating, being driven by a synchronous motor.

The machine exhibited at Wembley (one of the only two so far built) is rated at 2,000 kw., to deliver 20 amp. at 100,000 volts direct current. Of special interest is the fact that the sister machine, identical with this one, will make the transformation in the reverse direction, that is from 100,000 volts continuous to the three-phase alternating current. This feature radically differentiates its application from that of the Thury system, in which the utilization of the high-voltage direct current is a problem and is accomplished at constant current rather than constant voltage.

Obviously there is little new in the principle of such a machine for transformation from alternating current to direct current. A series of coils having induced in them the electromotive forces of a symmetrical polyphase system and all connected in series in a closed circuit will have no resultant electromotive force in the closed circuit, but will have between any two opposite points an alternating electromotive force. The maximum value of this alternating electromotive force will shift from one pair of points to the next, rotating about the circuit synchronously. If the successive junction points are connected to successive connections of a commutator, brushes revolving on this commutator synchronously will have between them a unidirectional or practically continuous difference of potential. This is an old principle, which was recognized early during the development of polyphase systems in general and the polyphase rotary converter in particular. It was utilized in the "penchahuteur" of Hutin and Leblanc, the so-called "permutator" and the synchronous converter of Arnold and Lecour, with which latter machine the present "transverter" is nearly identical—except for the important feature that a number of commutators are connected in series. The principal interest in the new machine lies in its claim to satisfactory operation —particularly satisfactory commutation—and in the reverse operation at the receiving end.

The machine is offered seriously as a practicable method for the use of continuous high voltage for the transmission line alone, thus leaving all existing methods of generation and distribution undisturbed. In this it is challenging attention—first, for the special service of submarine transmission at high voltage, where there are difficulties with single core iron-armored alternating-current cables, and later perhaps for overhead transmission. Machines of this type have not been adopted in the past for any purpose largely because of the difficulty or impossibility of securing satisfactory commutation, the complication arising in rotating brushes and the increased cost over existing methods. If the "transverter" will stand up satisfactorily in operation and perform the functions claimed for it, it could probably stand the burden of a considerable increase in cost. However, those who have examined the machine, even granting successful commutation of a 2,000-kw. unit, are wondering about successful commutation in 10,000-kw. units or above—the size necessary to begin to be of particular interest in this country. It is said by the inventor that the present size—approximately 15 feet by 15 feet by 10 feet—would not be exceeded by more than two feet in each dimension for a machine of 10,000 kw. The behavior of this machine in service will be of exceedingly great interest.

Wanted—A Standard Method of Rating Rivers

WHENEVER any figures are quoted on the horsepower-producing capacity of a river, there is always some one to arise and object that the figure is either too high or too low. The reasons back of the objections are perfectly understandable, and the frequency with which the objections are raised emphasizes the necessity for a more uniform method of "rating" rivers, if, indeed, it does not suggest the necessity of formulating a national or international standard.

A certain river, for example, might be said to have, without storage, 250,000 hp. available 90 per cent of the time, or 400,000 hp. available 50 per cent of the time, or 150,000 hp. available twenty-four hours of the day, which means all of the time; and then it might be added that with the provision of a stated amount of storage the river could produce 300,000 hp. continuously. And yet on this same river it might be desirable to install 500,000 hp. or 600,000 hp. in machinery to make the most effective use of its flow. It is not suggested that any rating can tell all the characteristics of a river. But it is apparent that a nationally or internationally standardized basis of rating the power capacity of a river would help materially in the understanding of statistical information along this line. It may be found necessary to have such a basis include two figures—for 50 per cent of the time and for 90 per cent of the time, for example—with the possible addition of an asterisk and a footnote in case practicable storage could modify the latter figure materially. However it may be worked out, some such recognized basis is needed. Here is real opportunity for both the American Engineering Standards Committee and the International Electrochemical Commission.

Electric Sign Industry Should Be Regenerated

THERE was a time when the electric sign was considered of great commercial importance to central-station companies. It was the principal piece of merchandise they had to sell, and it offered a spectacular opportunity for load building. This was in 1906. Today, while there are many more electric signs in use, little attention is being given by central stations to the development of sign business, although in terms of revenue per installation and profit on the sale of the equipment the electric sign is still as attractive as ever. Newer appliances and other interests have, however, diverted attention from it, and the sign business languishes. There are perhaps 150 manufacturers of electric signs in existence, not counting the innumerable local shops that turn out an occasional job to order. Probably less than a half dozen of these can be said to do a national business, and what with price cutting and the absence of established standards of practice and policy, there is little prosperity among sign manufacturers. Thus what might easily be a flourishing branch of the electrical industry remains dormant.

The suggestion has been made that electric sign manufacturers should organize, possibly as a section of the Associated Manufacturers of Electrical Supplies. These sign manufacturers would readily have the support and assistance of the manufacturers of wire, sockets and other materials that enter so largely into sign production. The idea deserves consideration. For a healthy, harmonious and aggressive sign industry would not only provide a market for its own wares, but would be of tremendous value to the light and power companies in creating a lively public interest in electric sign advertising.

The Electragists Show Encouraging Progress

THE convention of the Association of Electragists International, held last week at West Baden Springs, Ind., served to accentuate certain of the problems and difficulties confronting the electrical contractors. As is well known, the war blighted the wiring business and drove the electrical contractor into appliance merchandising for self-preservation. In this he showed no great proficiency at first, and even afterward it was all up-hill work. Naturally the contractors' association also felt the strain. Through it all, however, there has been a loyal nucleus of active members led by a number of the older and larger contractors who have held to the belief that the smallest of the four great branches of the electrical industry could and should ultimately build up an association with an influence, won in service to its members and to the industry, comparable with that of the other major group organizations. There was evidence at West Baden Springs last week that this constructive purpose is crystallizing in achievement—for example, in the work of the trade policy committee under W. Creighton Peet of New York, which has inaugurated a progressive analysis of distribution and merchandising policies within the industry, and of the code committee under A. Penn Denton of Kansas City, which has established local code committees in more than a hundred cities to work for inspection uniformity. Helpful work has been done from the association's headquarters also in active field service that has implanted better accounting systems and business methods in a large number of shops and stores. But the electrical contractors need encouragement, and it would be greatly to the interest of all branches of the electrical industry that this practical work which they have undertaken should be liberally supported. Membership needs strengthening, for two thousand out of a possible twelve thousand is too small a field to till with all the equipment. Manufacturers, jobbers and central-station companies should, therefore, use their influence through the coming year to bring the electrical contractors and dealers with whom they have business relations into this association work, so that they may have the benefits of co-operative education. By this means wiring standards, policies and practices will be raised to a higher plane and the entire industry will be benefited.

Safeguarding and Aiding Vision

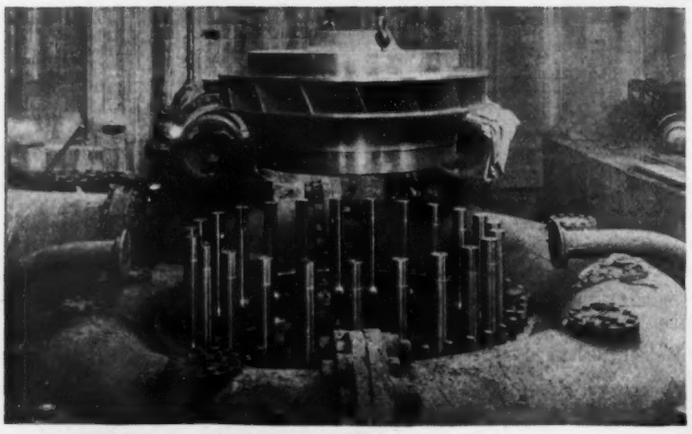
INTELLIGENT use of artificial light has not kept pace with the great strides made in light production, and therefore education in lighting is sorely needed by the public. But before the public can be educated it must become interested. One of the most effective approaches is along the line of conservation of vision. Furthermore, attention is given to the welfare of children in many cases where it will not be bestowed upon adults. For this reason those sincerely interested in the development of artificial lighting have directed much activity toward the use of eyes and of light in the schools where twenty million children, with eyes immature in growth and in function, are exposed to conditions which will leave their impress for good or for bad.

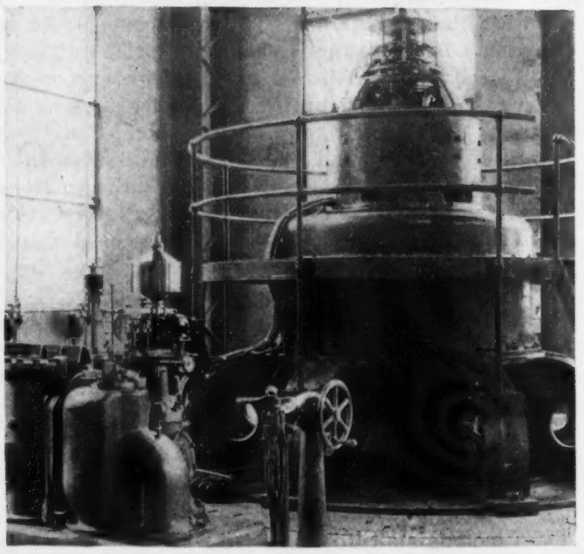
A considerable percentage of school children have defective vision which can be corrected by adequate and proper lighting combined with care for the eyes. Dr. James Kerr of London has stated that "one-third of our school children have such defective visual acuity that better illumination is necessary than for normal eyes." Certainly there is nothing inherently wrong with human eyes in general. They evolved as other organs and became well suited to outdoor lighting and conditions of brightness. But the human race eventually came indoors and for these later centuries it has been subjecting the eyes to feeble illumination and improper distribution of light.

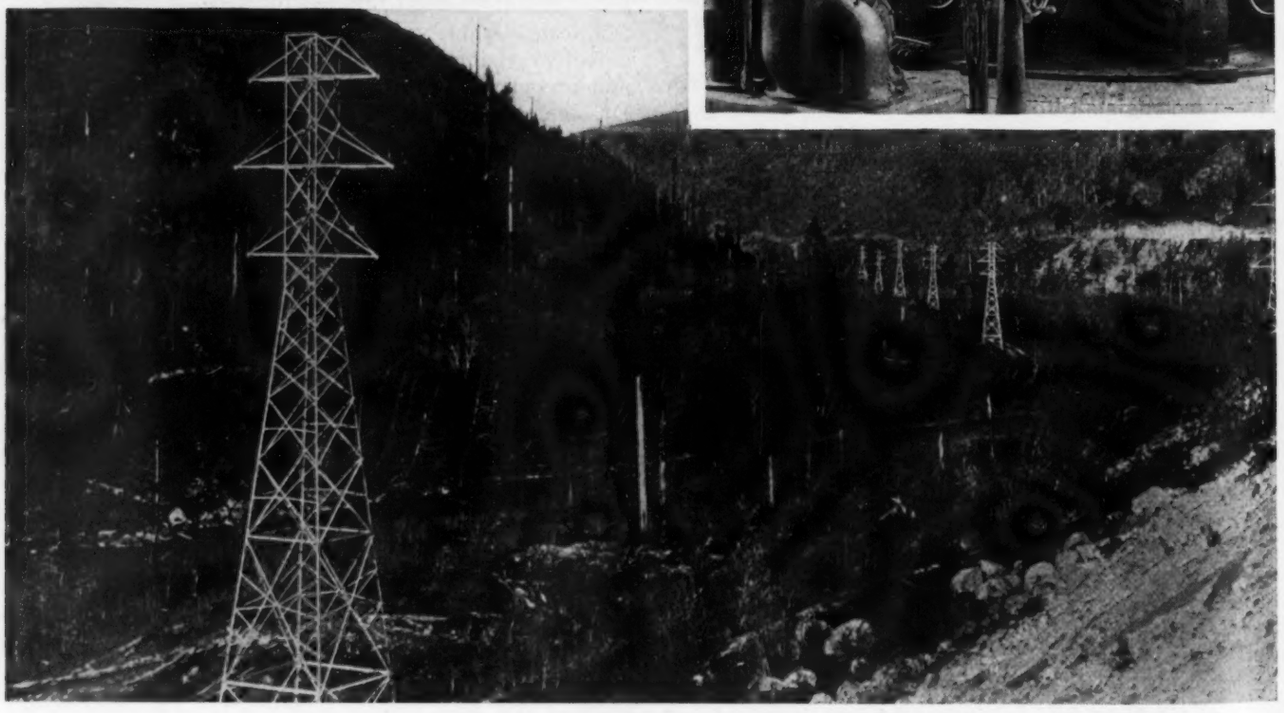
A number of years ago Professor Widmark of Stockholm reported on interesting investigations that had been carried out in the schools of that city over a period of ten years. He found that the percentage of near-sightedness increased with advance in grade. In the lowest grade only about 10 per cent of the pupils were near-sighted, but in the highest grade about 30 per cent showed this defect. After changes were made in the lighting and in the type used in textbooks, a steady improvement was noted. In ten years the proportion of near-sighted pupils was reduced 50 per cent.

It is certain that a similar improvement is taking place in our own schools where these are adequately and properly lighted. It is equally certain that in many of our schools and homes neglect of lighting and of the eyes is contributing toward defective vision. Preventable eye trouble is costing every nation on earth a great deal in wealth and in happiness. Defective vision is a serious handicap both for the individual and the nation. The most important movement in lighting education is that directed toward our children.

Oak Grove Plant in Oregon Operating with Highest Head Reaction Turbine







THE power supply of the Willamette Valley in Oregon has recently been augmented by the completion of the 30,000-kva. Oak Grove plant of the Portland Electric Power Company, constructed on one of the tributaries of the Clackamas River, at a cost of $8,600,000. In addition to having the highest head reaction turbine in the world, the plant possesses numerous other features unique in hydro-electric construction. Ultimate construction plans call for the installation of two additional 30,000-kva. units in the plant.

An arch-type diversion dam of concrete, 65 ft. high and 190 ft. long, is shaped to carry 7,000 sec.ft. floods. A head of 930 ft. is obtained by 7 miles of conduit. The ultimate development is planned for a flow of 1,200 sec.ft. The step just completed is a 400-sec.ft. development under 850-ft. net operating head. The 35,000-hp. reaction turbine drives a 30,000-kva., 11,000-volt, 60-cycle, 514-r.p.m. generator. A 250,000-circ.mil, 115,000-volt transmission line 18.71 miles long connects this station with the company's system at Station "G" at Farady.

Conducting a Distribution Survey—I

Three Objects that Made It Worth While to One Company—Improvements in Operation and Economy Made Possible by It—How the Work Was Organized and Carried On

By E. G. NICHOLS* and J. R. EYRE†

CONSIDERABLY more attention is being given to electric distribution economics than ever before, owing, probably, to the realization that a rapid development of distribution systems from small beginnings has not generally resulted in economical layouts. In a great many communities excellent possibilities for improvement in operation and economy exist which can only be made realities by a thorough study of existing conditions. Such a study would involve a compilation of all material in use in the distribution lines, an identification of the various circuits, a check of the number of connected customers, the numbering of poles and transformers and the segregation of the data so that permanent records may be established. Information of this character has been collected in a survey of the system operated by the Iowa Railway & Light Company. The territory covered included Cedar Rapids, Iowa, a city of some fifty thousand population, and ten outlying towns served by high-tension lines from the Cedar Rapids power station.

THREEFOLD OBJECT

Three important objects made this survey well worth while. The first was to provide data for keeping up a perpetual distribution property inventory, and the second to provide a means of studying existing load conditions. The third object, which was of possibly more importance than the two others, was to secure sufficient data to facilitate improving load conditions and enable the proper design of distribution extensions.

A perpetual inventory requires that a complete count be made of all property units as of the time of inventory and that means be provided to keep an absolute record of all units installed or retired after the original count. Kept in this manner, the inventory gives exactly the number of property units in service for any date. With this information it is an easy task to assign unit prices for valuation purposes.

A study of existing load conditions provides some of the most important information that can be obtained from a distribution system. The location of transformers as regards load centers, the connected load on transformers in comparison with their capacities, the primary and secondary wire sizes as related to the load, the connections of transformers as to whether two-wire or three-wire secondaries—all reveal information which is of inestimable value in determining whether the distribution is satisfactory. If redistribution is necessary, then the survey provides sufficient data to enable bringing conditions up to a standard where adequate regulation can be obtained.

Once the foregoing information is obtained and transferred to a suitable map for permanent record, it becomes an easy matter at any time to recheck service conditions. It is also a simple problem to plan distribution extensions intelligently, considered by themselves or as to their effect on the loading of the section to which they are connected. The latter is very important, for as existing load centers shift the distribution requirements must also be shifted and a knowledge of conditions is necessary to make suitable changes.

SELECTION OF FORMS FOR SURVEY

In making the Iowa survey it was decided to reproduce the primary, secondary and arc circuits accurately on maps and also provide an inventory of material, the maps furnishing all the information which would be necessary in solving load problems. Therefore the first step in preparing for the survey involved the adoption of suitable forms on which the material could be listed for inventory purposes and from which the desired information for mapping the circuits might be transcribed. In order that the data obtained might be used most efficiently, several forms, each comprising certain portions of the desired information, were made up. The forms chosen are shown in the accompanying illustration. Two of these forms—namely, Fig. 1 and 2—were developed especially for this survey and were supplemented by a field map embracing sections of the city one-half mile square. The other forms—namely, Figs. 3, 4, 5 and 6—are construction orders and permanent records developed or revised to permit keeping the inventory up to date. From these field notes, map, permanent records and construction orders permanent maps were developed and are being kept up to date.

The inventory sheets, shown in Figs. 1 and 2, were developed for the use of the field crew. Sheet "A" was designed for recording all information about the overhead system except the services, transformers and street-lighting equipment, which are covered by sheet "B." Sheet "A" indicates pole identification, height, cross-arms, conductor supports and appurtenances, kind, size and circuit number of overhead conductors, span length and auxiliary equipment. Sheet "B" indicates the kind, length and size of services, the make, type and company number of transformers, fixtures and the poles to which they are attached. It also indicates the poles owned by the company, as well as the jointly owned or foreign owned poles on which the company's lines made contacts.

One of the essential requirements which had to be met during the progress of the survey was the keeping of an accurate record of changes made in a district after the field men had mapped that particular district. For this purpose the forms shown in Figs. 3 and 4, called the overhead construction order and outside service order respectively, were used. These forms are still used in keeping the permanent maps up to date. Predesigned work is laid out beforehand on these forms and a copy given to the construction foreman as his

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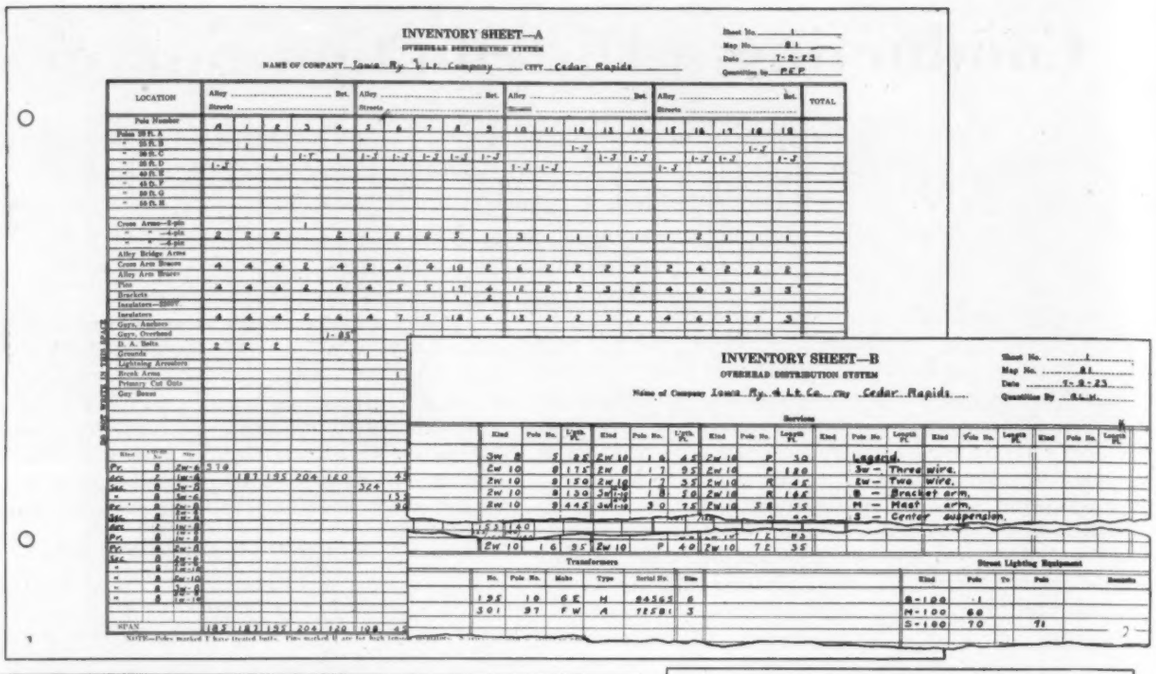
†Instructor in electrical engineering, State University of Iowa, Iowa City, Iowa.



INVENTORY SHEET—A

OVERHEAD DISTRIBUTION SYSTEM

NAME OF COMPANY Iowa Ry. & Lt. Company CITY Cedar Rapids

Sheet No. 1
Map No. 81
Date 7-2-23
Quantities by PEP

INVENTORY SHEET—B

OVERHEAD DISTRIBUTION SYSTEM

Name of Company Iowa Ry. & Lt. Co. City Cedar Rapids

Sheet No. 1
Map No. 81
Date 7-2-23
Quantities By A.B.H.

Services

Transformers

Street Lighting Equipment

OVERHEAD CONSTRUCTION ORDER

ORDER NO.

IMP. REQ. NO.

LOCATION Distribution Section 90, 14TH ST. between A & D Ave.

OBJECT OF WORK Install street light, extend distribution, and increase transformer capacity

DISTRIBUTION SECTION 90 FEEDER No. 7 APPROVED BY SUPT. DIST.

Parallel 2-5 KVA Transformers.

D to 90d7 run 2#6 Prim. wires 445 ft.
H to I to 3 to 13 run 3#4 Sec. wires 2800 ft.
7 to E to J run 2#4 Arc. wires 935 ft.
90d7 to 90d16 remove 3#6 Sec. wires 1200 ft.

Erect poles 35' Poles at A, B, C, D, E, F, G, H. 30' Poles at I, J.
Remove poles None.
Relocate poles 90d7 as shown.
Hang trans. 1-5 KVA at D 1-5 KVA at 90d18 Remove trans. 2a - 7.5 KVA from 3e d5
Install st. lt. fixture 1-Goose neck at J Remove st. lt. fixture
Install pole equipment Down guys at H, A, C, 90d 20, 90d13
New transformer equipment at 90d16
Remove pole equipment
Transfer Transformer equipment from 90d5 to D
Renew All secondary arms on old construction

Made up by GBC Date 7/12 1923 Comp. accord Inst. by Date 192

MAIN MATERIAL
1- st. light fixture
2-5 KVA Transformers
8-35' Poles
2-30' Poles
2800'-#6, 8500'-#4
40 X arms complete
8 days labor

Form R-126 150 M per pad 8-23

MAP POLE RECORD

Map No. 76 Location West Side Sheet No. 1

Checked by ABH. Transferred to Sheet No. —

Company Pole Numbers Removed	Company Pole Numbers Placed	Last No.	Foreign Pole Letters Removed	Foreign Pole Letters Placed	Last Letter
43c	43c	164	A		J.
45c	45c		F		
46d	46c		G	G	
9x-					

SUMMARY

Date	7/28/24						
Last Co. No.	164						
No. Poles Rsvrd.	4						
No. Co. Poles	160						
Last Foreign Letter	J.-36						
F. Poles Rsvrd.	3						
No. Foreign Poles	33						

Date	Poles Co.	Poles Foreign	Poles Total	Joint Poles Bell	Joint Poles C.R.&R.	Joint Poles W.U.	Joint Poles Total	Co. Pole Heights A	B	C	D	E	F	G	H
7/28/24	160	33	193	30	3	0	33	10	15	101	20	10	5		

OUTSIDE SERVICE ORDER

Form O-27—25 sets to pad—500 sets 10-23

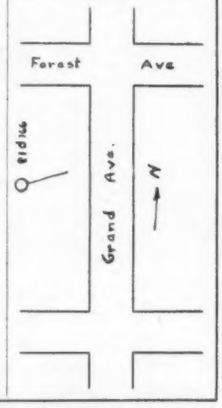
Date 7/24/24 No. 116

Connect ✓
Service at Pole and House
Disconnect
FOR
Address 2436 Grand Ave
Name John Doe
Remarks O.K. City Inspector RHA.

Signed A.R.h. Order Dept.

Work Completed 420 P.M. 7/24 192 4

Signed J. Rogne Foreman.



TRANSFORMER RECORD CARD

Make Westinghouse Type S Form Capacity 15 K.V.A.
Phase A Cycles 60 Volts Primary 2200 Secondary 110-220
Company No. 304 Mfg. No.
Serial No. 690372 Mounting Hanger

	Date Installed	Date Removed	Location	Second Wires 2 or 3	Lightning Arresters Make	Lightning Arresters Type
1	2/24/23	7/13/25	C.R. Map 100 Pole 17	3	G.E.	Comp.
2	7/7/24		C.R. Map 81 Pole 167	3	"	"
3						
4						

6A

Form 1270 Order 8911

INSPECTION AND TEST RECORD

	Date of Inspection	Oil Level	Oil Gals. Out	Oil Gals. In	Cond. of Ground	Cond. Lightning Arr.	Date of Test	Primary Amperes	Secondary Load Amps Right	Secondary Load Amps Left	Secondary Load Volts Right	Secondary Load Volts Left	K.V.A.	Signed
1	4/15/23	low	0	12	O.K.	O.K.	4/15/23	6.2	6.8	6.1.5	109	107	14	C.H.R.
2														
3														
4														
5														
6														

6

ADOPTION OF SUITABLE FORMS NECESSARY WHEN A COMPREHENSIVE DISTRIBUTION SURVEY IS PLANNED

The form shown in Fig. 1 covers the entire distribution plant except services, transformers and street lighting, the form shown in Fig. 2 being used for these. For revising inventory construction and service orders, Figs. 3 and 4 are used. Figs. 5 and 6 illustrate the pole and transformer records used. Both the front and back of the transformer record are shown.

order for doing the work specified, this copy being turned in to the map man by the foreman when the work is completed. On the cross-section half of the "construction order" are indicated the streets or alleys on which the work has to be done, all poles to be installed or removed being spotted with their numbers and location, position of guys and stubs, transformer or street-lamp locations and the services from each pole. The different items of equipment installed, including the wire sizes from pole to pole, transformer sizes and heights of poles, are recorded in the lower half of the form. The number of the map section in which the work is done and the number of the primary circuit feeding the section are shown in one corner.

KEEPING TRACK OF DISTRIBUTION CHANGES

The "outside service order" furnishes an excellent means of keeping a check on ordinary service connections and disconnections, which make up a considerable part of the line changes. The lineman making the service connection or disconnection simply indicates the approximate location of the house on the city block outlined on the edge of the form, names the streets and avenues and spots the pole with its number from which the particular service is run or removed. A short line is drawn from the pole to indicate the general direction of the service.

Two other forms which fit into the scheme for keeping the inventory up to date are the "pole record" (Fig. 5) and the "transformer record" (Fig. 6). The pole record is to provide information about poles on which the company has contacts, especially those which are removed or placed, information that will facilitate numbering the poles in consecutive order and a summary of pole information. One of these records is made out for each map section.

On the "transformer card" are included such data as the make, type, form, rating, phases, cycles, primary and secondary voltage, company number, serial number and type of mounting. The card also indicates the location of the transformer, the date on which the transformer was installed and the date on which it was removed from its former position. In addition, the type of secondary wires, whether two-wire or three-wire, and the make and type of lightning arresters are indicated. All these data are recorded on the front of the cards. On the back are spaces for indicating the date of any inspection, condition of grounds and any test records that may be carried out.

Each transformer has its own card, and the cards are small enough to permit a regular 4-in. x 6-in. card file to be used. Owing to the fact that transformers are frequently changed about and sometimes burn out, it is necessary for the card file to be adaptable to the above conditions. For instance, if a transformer is burned out and goes to the junk pile, its card is moved to that portion of the file covering transformers out of use. If a new transformer replaces the old one, a new card is made out bearing the information on the new transformer. A change in the transformer location is recorded on the original card. Cards are filed according to city or town, each card having an index tab bearing the company number of the transformer. The numbers are kept in consecutive order by town or city.

After the completion of the forms the personnel to undertake the survey was organized. By working the men in parties it was decided that one man couid run sheet "A" (Fig. 1), another sheet "B" (Fig. 2), and lineman could check wire sizes, pole heights, measure pole spans and place chalk numbers on poles and transformers. In addition to this group, one man was engaged to paint numbers on poles and another to transfer field notes onto the permanent map. As it was desirable to complete the survey in ten to twelve weeks, it was thought best to put on two parties to take the field inventory. This action made it necessary to place a second man on the transfer of field notes to maps. The survey was completed in a little less time than estimated, so two men were transferred from one of the field parties to the numbering of transformers.

As the Northwestern Bell Telephone Company was numbering poles with black paint, the Iowa Railway & Light Company believed it would be less confusing if it used some other color for numbering its poles. Consequently, a chrome yellow was selected, the mixture being the same as that used by the State Highway Commission on the primary road signs. This paint was highly recommended for its ability to withstand the effects of the elements and to remain legible for a long time—a very desirable feature in this case. The poles were not shaved. Instead the numbers were painted on the weathered surface of the pole. The latter method was chosen, after considerable experimentation, because it was concluded that the paint would soak into the tiny crevices and, when dry, would have a higher resisting force. Furthermore, the yellow numbers could be easily seen on the weathered surface, whereas visibility is very low on a shaved surface.

IDENTIFYING CIRCUITS

As stated previously, one of the aims of this survey was to identify the primary, secondary and arc circuits in regard to their circuit numbers. For instance, there were twelve primary circuits issuing from the power house, and it was desirable to show how they were distributed throughout the city. With such information it would be possible to study distribution of load between the primaries by means of the completed maps. Since all of the circuits extending from the power house, and even in the downtown district to a lesser degree, were highly congested, the task of separating the circuits and keeping them in order would have been very difficult. To this congested condition was added the complication that a given circuit might issue from the power house on the pole pins on the top arm, whereas at the end of a few spans the same circuit might be found with one wire on the outer pole pin on the top arm and the second wire on the road pin of the second cross-arm. On the other hand, in the outskirts of the city the various circuits carried by pole leads were very few in number. Possibly a primary, a secondary and an arc circuit might be found, or even fewer.

To give the field party greater freedom in establishing the identity of circuits, the survey was begun in the suburbs. The circuit number was identified by stationing one of the inventory party at the telephone in a residence served by any desired secondary while the engineer at the power house opened the switch which was believed to control the primary feeding this house. The lineman in the inventory party, who was well acquainted with the line layout, usually knew that the circuit in question had one of two numbers, so that only one or two of the twelve primaries had to be opened. When the lights went out the field man announced the fact to the engineer at the power house, who in turn gave the number of the circuit he had cut open. This cut-and-try method was carried out during

the noon hour. The time during which any circuit was open ranged from thirty seconds to one minute. Circuits thus identified were followed out in their entirety so that it was only necessary to cut the primaries at reasonably long intervals in the beginning, possibly more often than later in the survey. In this manner all the circuits were gradually identified as the field inventory progressed from the outskirts toward the center of the city. By the time the heavy leads from the power house were reached the identification of all circuits had been established.

In following out a given circuit the poles were spotted on the field map as near their true location as possible. The number of each pole and the letter distinguishing the height of the pole were placed on the map with the span in feet between poles. By using a detailed system of symbols it was possible to indicate the ownership of the poles on the field map. The number of services from each pole and their general direction were also noted on the field map. At the same time sheets "A" and "B" (Figs. 1 and 2) were filled out.

To have the inventory party paint the numbers on the poles as they went along would slow them up so that the work would not be completed in the time allowed. Consequently, the lineman in the inventory party only placed chalk numbers of the map number, height of pole (indicated by letter) and pole number on each pole. He was followed up by a pole numberer who painted the pole number on each pole. The expense of having a boy to paint the pole numbers was more than offset by the saving in time of the three men in the inventory party. To transformers a company number was also given, which, together with the rating of the transformer, was painted on the case. The numbers were made of such size as to be readily legible from the ground.

TRANSFER OF FIELD NOTES TO PERMANENT RECORDS

As soon as the field inventory was completed for a given map section sheets "A" and "B" (Figs. 1 and 2), together with the field map, were turned in to a draftsman, whose duty it was to transfer the field notes onto the permanent maps. The permanent map embraced the same portion of the city as the field map. However, since it had to be permanent and would be subjected to much usage, it was necessary to provide a texture with lasting qualities. Consequently, the maps were made with a cloth background covered with a facing which would provide a satisfactory surface on which to lay out the distribution lines in India ink.

Excessive Voltage in Generators

By WALDO V. LYON
Associate Professor Massachusetts Institute of Technology

SOME interesting and unusual test data were recently brought to the writer's attention. A possible explanation of the result that was obtained involves a point in the theory of alternating-current generators about which little has been written. The generator in question was one having a capacity of 5,000 kva. at 11,000 volts and was arranged to supply power from two of its phases to a single-phase railway. The third phase was isolated from the two others and grounded. The diagram of connections is shown in Fig. 1.

The phases *ao* and *bo* were arranged to supply the single-phase power; the third phase, *dg*, was isolated and grounded at *E* as indicated in Fig. 1. A potential transformer was connected across the terminals *b* and *d*. The circuit breakers *CB* were open so that the generator was completely isolated. The excitation was such that if the points *g* and *o* had been connected the voltmeter would have indicated approximately the rated terminal voltage of the generator, viz., 11,000. Actually the voltmeter went off the scale, showing something in excess of 20,000. The possibility of thus nearly doubling the terminal voltage of the generator, with the attendant increase stress on the insulation, is important enough to warrant a careful analysis. In what follows it is assumed that the result is completely explained by the capacitance of the armature windings with respect to the armature core. Even if this assumption is not entirely correct, the analysis is interesting.

Consider a full-pitch armature coil in which there is generated an emf. of E, and assume that there exists a potential of E_1 between one end (m) of this coil and the frame of the generator. At the other end (n) of the coil the potential measured to the frame is $E_1 + E$. This sum must, of course, be taken in a vector sense since alternating-current quantities are being dealt with (see Fig. 2).

The potential along the active, or embedded, portion of the coil increases uniformly from m to n, so that at a point x from the m end the potential to the frame is $E_1 + xE$, where x is the fractional distance along the coil. If the total capacitance between the coil and the frame is C, the capacitance at the point x of a small portion of the coil is Cdx. The capacitive

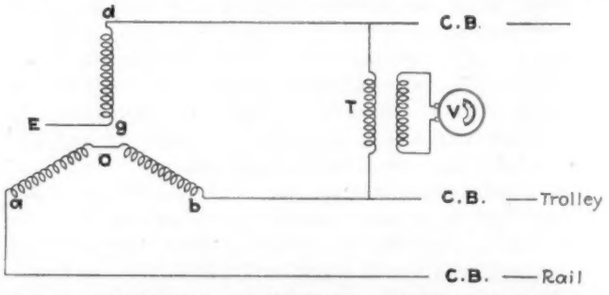


FIG. 1—CONNECTIONS OF GENERATOR SUPPLYING A RAILWAY LOAD FROM TWO PHASES
Voltmeter read over 20,000, while normal rating was 11,000

current for this small portion of the coil is then $j\omega Cdx(E_1 + xE)$. The capacitive current for the whole coil is $\int_0^1 j\omega C(E_1 + xE)dx$. This equals $j\omega C[E_1 + (E/2)]$. Thus the capacitive current is the same as if the entire capacitance were acted on by the potential that exists between the frame and the middle of the coil, viz., $E_1 + (E/2)$. It will be noticed that we have neglected the resistance and inductance drop along the coil due to the capacitive current. This is entirely negligible as compared with the generated

emf. It is in this respect that the solution differs from that of a uniform transmission line. From the standpoint of simplicity, however, it is an extremely important difference. There is another interesting way of stating the foregoing conclusion in regard to the capacitive current. It is this. Draw the vector representing the emf. generated in the coil in its proper relation to the assumed zero potential of the frame. The capacitive current due to the uniformly distributed capacitance is the same as if the same amount of capacitance were concentrated at the center of gravity of the emf. vector. If it can be shown that this idea holds when there are two coils, it will of course hold in any case, that is, for an actual generator. Let the coil emfs. be E' and E'', and the potential between the frame and the beginning of the first coil be E_1 as before (see Fig. 3). The capacitive current between the first coil and the frame is $j\omega C'E_{op}$ and between the second coil and the frame is $j\omega C''E_{oq}$. If it be assumed that these capacitances and the coil emfs. are both proportional to the length of the coil, they will be proportional to each other. Thus there are in the capacitive currents vector quantities whose magnitudes are proportional to the product of the distance of the center of a line to a fixed point, viz., *op*, for example, and a quantity that is itself proportional the length of a line, viz., $\omega C'$ for example. In mechanics this product is known as the moment of the line about the fixed point *O*, provided the mass of the line is taken as $\omega C'$. The vector sum of the moments divided by the sum of the masses is defined as the vector to the center of gravity of any system of lines.

Since the total capacitive current is the vector sum of the several currents, it at once follows that the total capacitive current is the same as if the total capacitance were concentrated at the center of gravity of the vectors which represent the emfs. of the individual coils. That is, in Fig. 3 the total capacitive current is $j\omega(C' + C'')E_{oc}$; where *c* is the center of gravity of the emf. vectors E' and E''. In general the procedure is as follows: Draw the vectors which represent the emfs. in the successive coil sides from the beginning to the end of the winding in question. Find the center of gravity of this system of lines. The total capacitive current between the winding and the frame is the product of the total capacitance and the emf. between the frame and this center of gravity of the emf. vectors shown in the illustration.

In a distributed winding having a pitch of unity the position of the center of gravity is at the terminus of the vector E_c, where

$$E_c = j\frac{E}{2}\left[\frac{1}{n\tan\alpha/2} - \frac{1}{\tan n\alpha/2}\right]$$

α is the angle between the successive coils and n is the number connected in series. E is the resultant emf. of the coils. This displacement of the center of gravity from the center of the resultant emf. will not amount to much in a multipolar machine having a lap winding. With a wave winding it might be appreciable, however. In what follows it will be disregarded for the sake of simplicity.

We are now in a position to analyze the circuit described in Fig. 1. The vector diagram is shown in Fig. 5. It will be observed that the capacitive impedance between the frame and the windings *ao* and *bo* is in series with the potential transformer and the generated emfs. in the armature windings. Find the center of gravity *c* of the emf. vectors E_{ao} and E_{ob}. The resultant emf. applied to the potential transformer and the capacitive impedance between the frame and the windings *ao* and *bo* is the vector drawn from *c* to the terminus of E_{dg}. The length of this vector is $(\sqrt{37}/4)E_{ao}$. The voltage across the transformer is proportional to its impedance and is $V_T = [Z_T/(Z_T + Z_C)]\sqrt{37}/4(E_{ao})$

$$\text{or} \quad V_T = \frac{1}{1 + (Z_C/Z_T)}\sqrt{37}/4(E_{ao}).$$

Let it be assumed that $E_{ao} = 11{,}000/\sqrt{3}$

and that $Z_C/Z_T = 1/\underline{-90°} \div /\underline{60°} = 1/\underline{-150°}$.

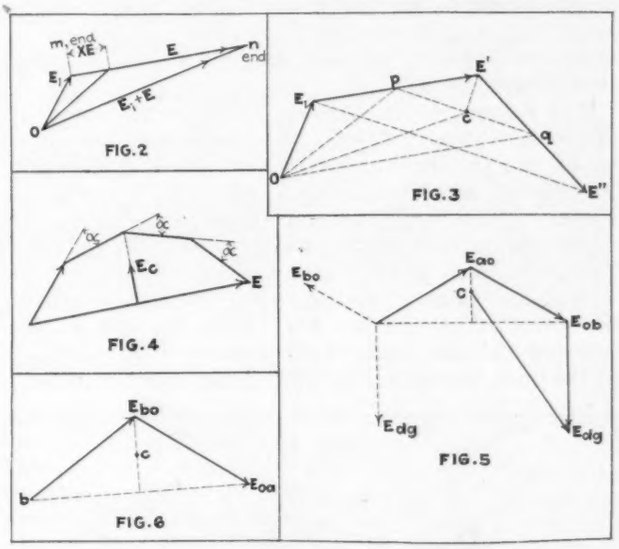
Then $1 \div (1 + 1/\underline{-150°}) = 1 \div (0.52/\underline{75°})$

$$= 1.92/\underline{-75°}$$

$$\therefore V_T = 1.92\sqrt{37}/4(11{,}000/\sqrt{3})$$

$$= 18{,}500 \text{ volts.}$$

Since there are in this series circuit the possibilities of resonance, very dangerous voltages may appear across the potential transformer and likewise between the winding and the frame.



VECTOR DIAGRAM ANALYSIS OF GENERATOR CIRCUIT

Fig. 2—If E_1 is potential between frame and coil at one end, then $E_1 + E_2$ may be the potential between frame and coil at the other end.

Fig. 3—Uniformly distributed capacitance may be concentrated at the center of gravity of the emf. vector.

Fig. 4—Showing center of gravity of a distributed winding with a pitch of unity.

Fig. 5—Vector diagram of circuit shown in Fig. 1.

The capacitive impedance Z_C between the frame and *ao* and *bo* can be determined as follows: Ground one terminal, *b*, for example, through a low-scale ammeter and leave the other terminal *a* free. From Fig. 6 it is evident that the emf. applied to the capacitive impedance is E_{bc}, which equals $E_{bo}\sqrt{13}/4$, or $0.9E_{bo}$. The impedance is then $Z_C = 0.9E_{bo}/I$, where I is the ammeter reading. If the terminals of any winding are free, there can be no net capacitive current to the frame, and therefore the potentials will be so adjusted that the center of gravity of the emf. vectors is at earth potential. Thus in Fig. 1, if both *a* and *b* are free, the voltage between *O* and the frame is $E_{ao}/4$. With a symmetrical Y-connected armature winding it will readily be seen that the neutral of the winding is at the frame potential. In a symmetrical delta-connected winding the maximum emf. to the frame is the line voltage divided by $\sqrt{3}$, and the minimum is one-half the maximum.

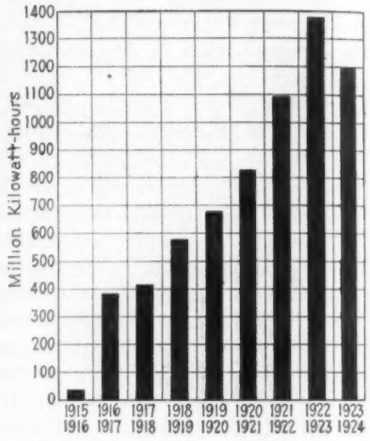
German System Readopts Petersen Coil

Ungrounded 1,000-Km., 110-Kv. Network in Central Germany Finds Protection Necessary After Removing Coils Two Years Ago

THE Elektrowerke Aktiengesellschaft, with headquarters in Berlin, Germany, has a network of more than 1,000 km. of 110-kv. high-tension transmission lines upon which, after experience both with and without Petersen coils, it is now replacing the coils for protection.

The accompanying map shows a diagram of the system and also of the subsidiary networks operating at 50 kv., 60 kv. and 80 kv., these subsidiary networks being customers of the main 110-kv. network. The tabulation accompanying the map indicates the installed capacity and the amount of equipment usually operating at the various generating stations. The maximum capacity running at any one time seldom exceeds 400,000 kva.

The history of the experience with flashovers on this system is as follows. The system originally was based upon the three plants at Zschornewitz, Lauta and Trattendorf, with the line usually open at Lauta. Petersen coils were installed at each of these three power plants and totaled about 2,000 kva. capacity. The 50-kv. and 60-kv. interconnected customers' networks are also protected with Petersen coils to the extent of about 2,800 kva. When the system was operated on this basis no flashovers were recorded on the lines, but there was difficulty in both the generators and the transformers at the three generating stations at which Petersen coils were installed. No satisfactory analysis of the cause of these equipment troubles has been made except that the manufacturers lay the blame on equipment failure and not upon the presence of the Petersen coils. Nevertheless, these Petersen coils were removed from these three stations about two years ago, and since that time the system has been operating without any Petersen coil protection, without lightning protection and entirely ungrounded. All of this time, however, the 50-kv. and 60-kv. customers' networks have retained the Petersen coils and have also been protected with horn-gap lightning arresters in series with resistance.



EXCEPT FOR LAST YEAR'S INDUSTRIAL DEPRESSION, THE ENERGY SALES OF THIS FIFTEEN-CUSTOMER SUPERPOWER NETWORK HAVE CONSTANTLY INCREASED

During the past two years this system, which is in a region of frequent thunderstorms, has suffered a good many insulator flashovers. The usual consequences of tripped switches, motor-generator disconnection and other disturbances to service followed the flashovers; moreover, subsequent flashovers have frequently occurred at points which were apparently weakened at the time of the first flashover but where no flashover occurred at the time. No sufficiently definite chronology or data on these flashovers have been kept to indicate any particular conclusion.

MAP OF TRANSMISSION NETWORK OF THE ELEKTROWERKE AKTIENGESELLSCHAFT AND ITS CUSTOMERS, SHOWING LOCATION OF POWER PLANTS

	Equipment in Kw.		Equipment in Kw.
Zschornewitz*	160,000	Grube Kayna	20,000
Trattendorf*	86,000	Brandenburg	3,000
Lauta*	66,000	Spandau	18,000
Berlin group	†180,000	Bitterfeld	‡20,000
Finkenherd	24,000	Magdeburg	Not operating
Hirschfelde	80,000	Leipzig	Not operating

*These three plants are owned by the E.A-G.; all others are under other ownership but their output is purchased by the E.A-G. †Only 50,000 kw. to 60,000 kw. normally operating. ‡Operates occasionally.

The company has now decided, however, as a result of watching the effect of Petersen coils on the low-tension systems and also on the 80-kv., three-circuit line from Zschornewitz to chemical works 23 km. north where 500,000,000 kw.-hr. per year are consumed, that it will be advisable to re-equip the system with these coils. The following plan has been adopted for this re-equipment. Altogether there is about 1,000 km. to protect, in 110-kv. lines. In addition, from Zschornewitz to Spandau 280 km. is now under construction. It is calculated that the total earth current of this system in case of a ground will be about 300 amp. Coils are being placed at points such as Magdeburg, Berlin, Grube Kayna and Süd and will be placed later at Brandenburg or Spandau. The theory of the engineers responsible for their location is, first, that the Petersen coils will not be near equipment and that therefore the danger of recurrence of old equipment trouble will be obviated, if by any chance the Petersen coils were the cause of that; and second, that the Petersen coils will be so located that if the system is cut to pieces in operating—that is, if any piece is cut off in operating or switching—the corresponding Petersen coil compensation will be simultaneously cut off and the necessary adjustment to a compensation for the remaining part of the system be automatically made. It has been found through the German experience that 15 per cent plus or minus compensation on moderate-voltage systems or 10 per cent plus or minus compensation on

high-voltage systems, such as 110 kv., is sufficient to permit the Petersen coils to give adequate protection on the circuits.

With reference to the load on this system, the principal consuming points are Berlin, Zschornewitz and Magdeburg, each of these cities having a load from 60,000 kw. to 70,000 kw.

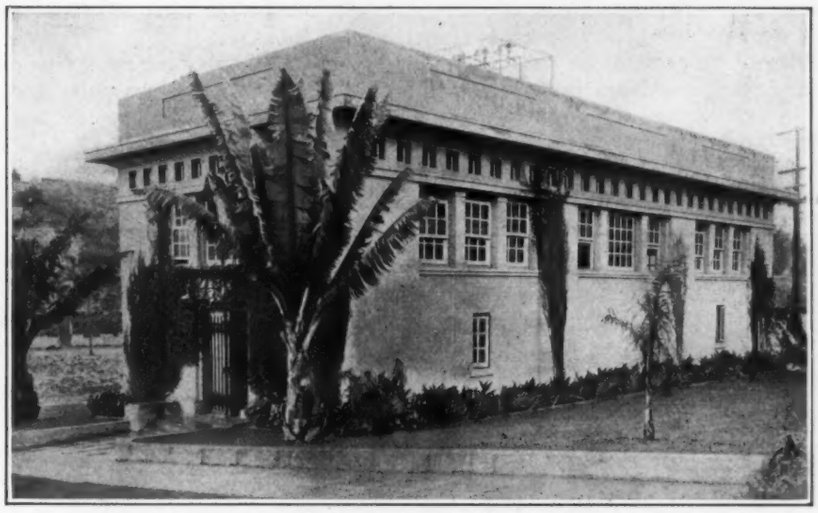
A second accompanying diagram indicates the total kilowatt-hour sales from the plant of the company. There are only about twelve or fifteen customers, this system being primarily a producing and transmission superpower system selling to retail distributors or extremely large industrial consumers.

The engineers look toward the Petersen coils as the one way to solve their present flashover troubles. Some of these, though, admit that a grounded system would probably be preferable to Petersen-coil protection, but post office requirements to obviate possible inductive interference with telephone and telegraph lines prevent the grounding of this system.

The Engineer's Responsibility in Public Relations

Bad Influence of Ill-Placed Distribution Lines Is Emphasized —Good Impression Is Created by Well-Kept Premises and Avoidance of Scenery Defacement.

By B. A. WOLLABER
Pasadena, Cal.



NEATLY MAINTAINED SUBSTATIONS AND OTHER STRUCTURES HELP IN ESTABLISHING CORDIAL PUBLIC RELATIONS

TO ANY thinking person it must be apparent that no single subject is receiving more attention at the hands of utility executives today than that of public relations. One can scarcely pick up a publication dealing with matters electrical that does not contain one or more articles on this important subject, while many thousands of dollars are annually being spent to further the work. There is not a single department in any utility company that is not directly concerned, and it is the purpose of this article to treat the matter from the standpoint of one of the most important departments of the industry—that of the engineer—and its relation to this very live issue.

Primarily that person is considered valuable who has a proper sense of responsibility, and a business concern or a public utility company without a true sense of its duty and responsibility to its customers cannot be ranked as a very valuable addition to any community. Responsibility is the keynote of public relations, and companies and employees advance in the regard of the public to the extent that they have a proper conception of the responsibility that devolves on them in connection with their service and dealings with their customers. The difficulty lies in arriving at the degree of responsibility each should feel in this matter and in determining how every department can best assist in this all-important work.

Probably no one comes in for more criticism at times than the engineer and the engineering department. This department is often found to be an easy dumping place for complaints, however unjust they may prove to be; but nevertheless there is no question that the work of the engineer is constantly before the public and will become a cause of irritation or otherwise in proportion as this department takes into consideration its responsibility. Poorly located distribution lines, on residence streets rather than in alleys or on property lines; badly designed and improperly located substations or other buildings, all indicate a lack of appreciation of the wishes of the people and are a constant source of annoyance to them. There should never be a distribution line contemplated or installed or a substation or other structure built without taking into consideration the probable effect upon the surroundings. It may be said that enough time is not available to go into matters of this kind, but time must be taken in order to maintain the proper relations between the communities served and the light and power companies.

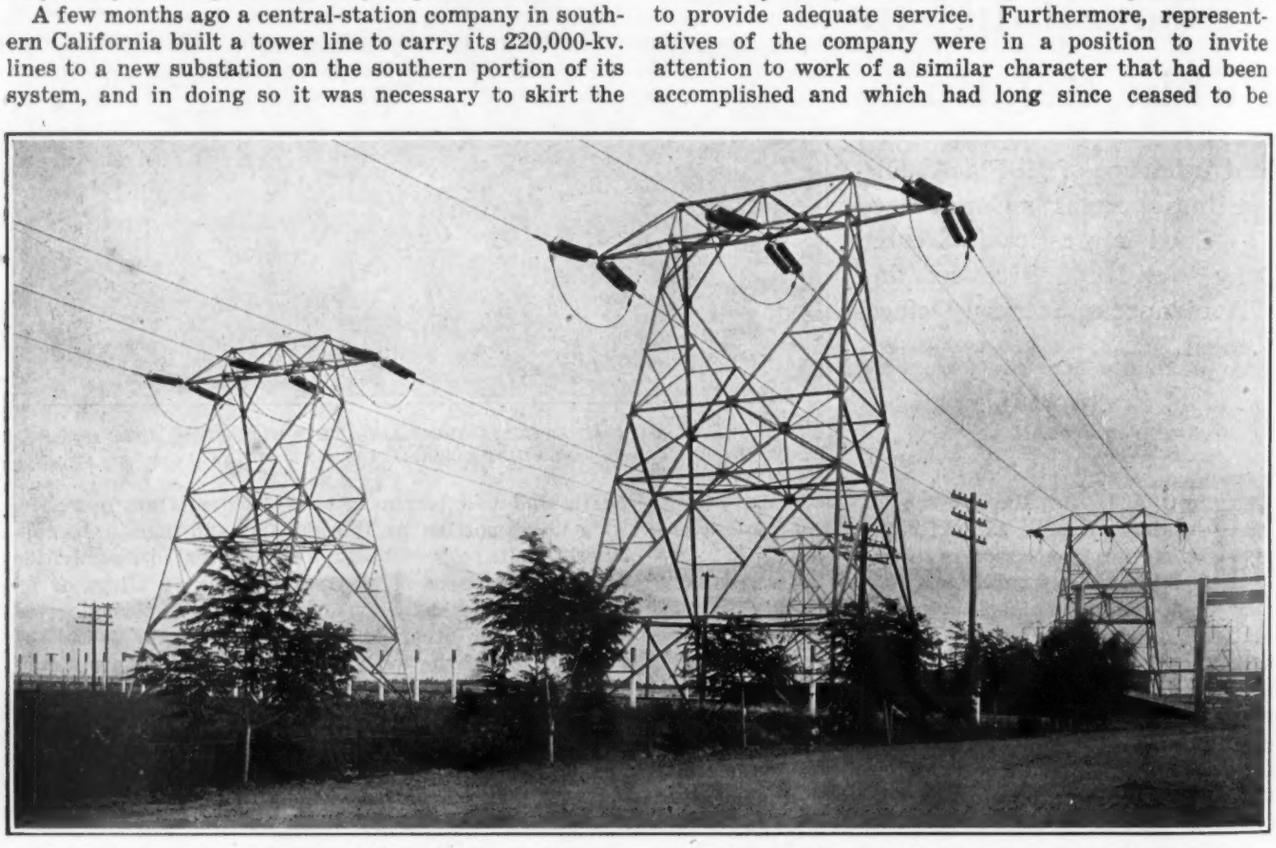
Very recently a patron of a certain utility company doing business in the West called on the manager in regard to a pole line that was being run past his residence. This man resided on an attractive boulevard. and the residents had tried to keep all poles in the rear of the property. The customer asked the manager of this company why it was not possible to locate this particular line on the property in the rear of his residence, where a right-of-way would gladly be granted. The manager informed him that his company paid a considerable sum annually in franchise tax for occupying the streets and that so long as the people demanded service they would have to put up with lines where the company chose to put them. He also made the statement that this line had been located by the company's engineering department and that the engineering department would insist on its being installed where it had indicated, which was on the street. This line was

finally built in front of the residences of this man and his neighbor, where it is an eyesore and source of irritation to all living in the vicinity.

While it is obvious that this was not the proper way to treat such a situation, the case is nevertheless indicative of the point it is desired to make. Here the responsibility was passed to the engineering department, and if this department had been properly advised or had had a proper understanding of its duty to the public, it probably never would have located this line on the street in front of these splendid homes. Too much care cannot be taken in this regard, and a utility company will succeed in its relations with the people it serves in just the proportion that it looks after these things. To some departments they may seem small, but they really are large in this very important work.

A few months ago a central-station company in southern California built a tower line to carry its 220,000-kv. lines to a new substation on the southern portion of its system, and in doing so it was necessary to skirt the mountains above one of the finest residence sections in this part of the state. It happens that the people in this vicinity are extremely sensitive on what they term desecration of the natural scenery of the mountains, and when construction work was begun a great many protests were made to the company and also to the local newspapers. In locating this line the company's engineers were guided very largely by the thought of good public relations, and it was built where it would attract a minimum of attention and cause as little annoyance as possible. Preceding this construction work, however, the public was taken into the confidence of the company, and a full explanation was made by means of a number of articles in the local papers relative to the necessity for the new line. Its purpose was made clear, as was the fact that the rapid growth of the community rendered it necessary for the company to provide increased service.

In this way the public was more or less prepared for what was to come, and therefore it was not surprising that, notwithstanding an insistent demand on the part of some citizens that the newspapers take the matter up and make an issue of it, the only result was an able editorial in one of the large dailies in which the editor approached the subject from the standpoint of progress and responsibility. After outlining changes that had taken place in matters of transportation, covering evolution from the horse-drawn vehicle to the automobile and later to the airplane, the article went on to say that the transmission line in question was simply another manifestation of progress and indicative of the great growth that was taking place and was bound to continue in that region. Moreover, the editorial maintained, the company was only living up to its responsibility to the community and proceeding along the best possible lines to provide adequate service. Furthermore, representatives of the company were in a position to invite attention to work of a similar character that had been accomplished and which had long since ceased to be noticeable, the structure having been absorbed in the landscape. After these explanations opinion changed and there were no further complaints.



TOWER LINES CAN BE MADE ATTRACTIVE BY PLANTING A FEW SHRUBS AND CLEANING UP DÉBRIS AFTER WORK IS COMPLETED

This instance is indicative of what can be accomplished if care is taken in planning construction work with due regard to the rights and feelings of others, particularly at this time, when business is beset by critics with sinister motives who are on the alert for opportunities to reflect unfavorably. The engineer can be of the greatest assistance in this regard if in planning a job consideration be given to the effect the work will have on the community where it is to be done, and a great advance in the improvement of public relations can be made through such channels. The time is past when any utility company can override the wishes of the public, and in proportion as companies realize their responsibility in this regard, in that proportion can they create a favorable impression and come closer to their hopes and ideals.

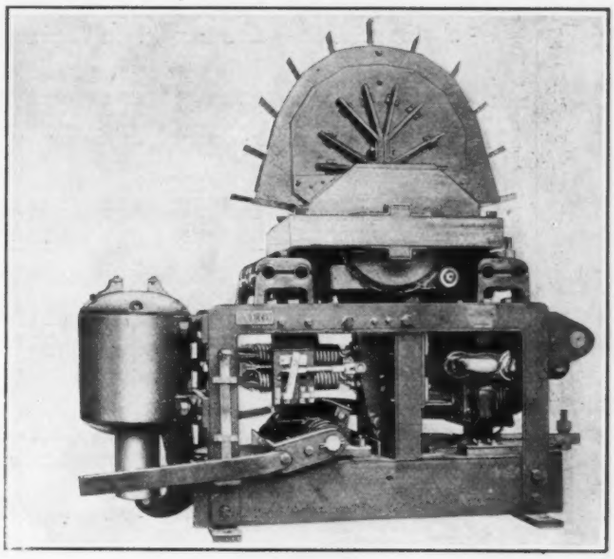
Thoughtful care should always be given to construction for hydro-electric installations, whether they be in far-away mountain canyons or at points near to the center of population. There should be no unnecessary destruction of trees or shrubbery or marring of the natural beauty of the scenery. All débris should be cleaned up after the work is finished, and perhaps trees or shrubs should be planted to improve the appearance of the scarred places. The putting in of a lawn around a substation, a neatly painted fence, the removal of unsightly outbuildings—all of these things go to improve a company's relations with those it serves and bring its customers to feel a pride in the utility.

EFFECT ON PUBLIC RELATIONS

Another thing—most utility companies at this time are inviting their customers to become partners. How can any public-spirited citizen be expected to become a partner in a company that maintains poorly constructed lines, dirty and ill-kept substations, yards, lawns and offices? How can the people termed partners be expected to feel a pride in a company whose properties are not maintained in accordance with a high standard of cleanliness and efficiency?

This is an age of progress, and progress is made in the same degree that responsibility is recognized. No one can assist more than the engineer or the construction department once they come to an understanding of how important a bearing the work under their control has on public relations. How well the job can be done can be measured only by the results obtained. Let a comparison be made between the work of today and that of times gone by. Compare the close relations existing between utility companies and the people they serve, consider the thousands of partners daily coming into the business, a large majority of whom reside in the communities served, and then ask whether or not the work being done is up to the standard required of the industry, whether or not consideration is given to the effect of any particular piece of construction on the public mind, whether or not the company is as careful as it should be in the location of lines, substations and gas holders, whether care is used in cleaning up the débris around construction work, even to the extent of removing surplus dirt from a pole line on a residence street, whether employees are careless in trampling on the lawns, if not the rights, of consumers. In the degree to which these questions are answered in the manner they should be answered is an advance being made in our dealings with the public.

There is an awakening to the responsibility that devolves on every department of the industry in connection with this far-reaching subject. Let the engineer, therefore, work hand in hand with the commercial and other departments in a consistent endeavor to bring about cordial and harmonious relations between his company and those it serves. Satisfactory public relations are a necessity to progress and prosperity in the electric utility industry, and the engineer can do much to make or mar the ideal conditions desired.

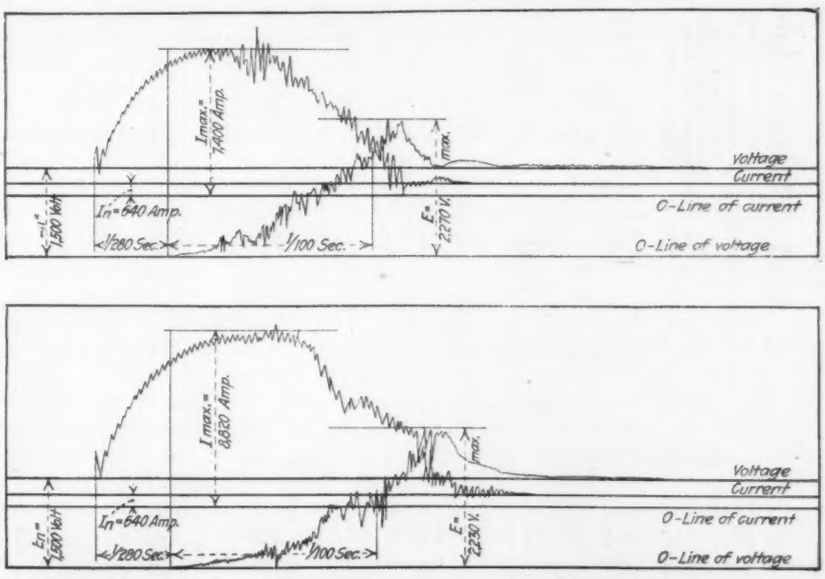


A. E.-G. HIGH-SPEED CIRCUIT BREAKER FOR JAVANESE STATE RAILWAYS

New German High-Speed Circuit Breaker for Javanese State Railways

A NEW high-speed circuit breaker which in one-sixtieth of a second will extinguish an arc arising to 9,000 amp. on 1,500-volt railway circuits has just been manufactured by the Allgemeine Elektricitäts-Gesellschaft in Berlin for the state railways of Java. The breaker contains no specially new features but is a development and refinement of the regular A. E.-G. high-speed breaker. The accompanying illustration shows the particular breaker in question. Two oscillograms show short-circuit tests which were made on this breaker.

The breaker operates to open the main circuit, but it is shunted by a resistance which with the normal 1,500-volt circuit will draw 640 amp. A second breaker operation then opens the circuit in another place. The breaker is a part of an order for the Javanese State Railway which is being filled by the A. E.-G.



OSCILLOGRAMS OF TWO SHORT-CIRCUIT TESTS ON HIGH-SPEED CIRCUIT BREAKER

Central-Station Lighting and Power Customers, Showing Growth During 1923

	Total Domestic Lighting Customers				Total Commercial Lighting Customers				Total Industrial Power Customers				Total Central-Station Customers of All Kinds			
	Jan. 1, 1923	Jan. 1, 1924	New Customers Added During 1923	Per Cent Gain	Jan. 1, 1923	Jan. 1, 1924	New Customers Added During 1923	Per Cent Gain	Jan. 1, 1923	Jan. 1, 1924	New Customers Added During 1923	Per Cent Gain	Jan. 1, 1923	Jan. 1, 1924	New Customers Added During 1923	Per Cent Gain
United States	9,925,210	11,724,023	1,798,813	18.2	1,954,450	2,262,755	308,305	15.8	455,060	533,319	78,259	17.3	12,334,720	14,520,097	2,185,377	17.7
New England	879,060	1,066,510	187,450	21.4	189,900	224,260	34,360	18.2	40,400	45,689	5,289	12.8	1,109,360	1,336,459	227,099	20.4
Middle Atlantic	2,160,540	2,567,420	406,880	18.8	487,200	538,580	51,380	10.7	88,960	95,913	6,953	7.8	2,736,700	3,201,913	465,213	17.2
South Atlantic	626,820	756,276	129,456	20.7	142,380	164,970	22,590	15.8	27,890	32,591	4,701	16.5	797,090	953,837	156,747	19.7
East North Central	2,761,840	3,211,630	449,790	16.3	483,060	561,860	78,800	14.2	108,500	124,168	15,668	14.5	3,353,400	3,897,658	544,258	16.4
West North Central	1,134,090	1,334,607	200,517	17.7	215,950	251,100	35,150	16.3	50,170	62,624	12,454	24.8	1,400,210	1,648,331	248,121	17.7
East South Central	294,820	377,620	82,800	28.0	55,250	73,325	18,075	32.8	13,450	19,806	6,356	47.2	363,520	470,751	107,231	29.5
West South Central	630,920	721,030	90,110	14.4	100,740	121,920	21,180	21.0	24,610	32,825	8,215	33.4	756,270	875,775	119,505	15.8
Mountain	378,200	419,920	41,720	11.0	59,440	67,080	7,640	12.7	17,900	21,536	3,636	20.4	455,540	508,536	52,996	11.8
Pacific	1,058,920	1,269,010	210,090	19.8	220,530	259,660	39,130	18.0	83,180	98,167	14,987	18.1	1,362,630	1,626,837	264,207	19.3
New England																
Maine	101,840	115,710	13,870	13.6	23,420	30,940	7,520	32.1	4,740	5,508	768	16.2	130,000	152,158	22,158	17.1
New Hampshire	42,450	46,190	3,740	8.8	9,820	10,640	820	8.4	2,610	2,860	250	8.7	54,880	59,690	4,810	8.7
Vermont	47,950	52,640	4,690	9.8	8,620	11,210	2,590	30.2	2,170	2,383	213	9.8	58,740	66,233	7,493	12.8
Massachusetts	455,560	550,490	94,930	20.8	102,960	113,540	10,580	10.2	17,970	21,583	3,613	20.1	576,490	685,613	109,123	19.0
Rhode Island	57,730	72,290	14,560	25.3	15,690	16,860	1,170	7.5	3,170	3,335	165	5.3	76,590	92,485	15,895	20.8
Connecticut	173,530	229,190	55,660	32.0	29,390	41,070	11,680	39.4	9,740	10,020	280	2.8	212,660	280,280	67,620	31.8
Middle Atlantic																
New York	1,051,970	1,190,690	138,720	13.2	264,130	288,600	24,470	9.3	40,110	43,240	3,130	8.0	1,356,210	1,522,530	166,320	12.3
New Jersey	376,270	458,290	82,020	21.9	74,320	84,530	10,210	13.7	17,570	19,169	1,599	9.1	468,160	561,989	93,829	19.8
Pennsylvania	732,300	918,440	186,140	25.5	148,750	165,450	16,700	11.2	31,280	33,504	2,224	7.1	912,330	1,117,394	205,064	22.4
South Atlantic																
Delaware	17,780	20,560	2,780	15.6	5,380	6,140	760	14.1	730	845	115	15.7	23,890	27,545	3,655	15.4
Maryland	111,290	122,290	11,000	9.8	22,480	23,050	570	2.5	3,360	3,788	428	12.7	137,130	149,128	11,998	8.8
Dist. of Columbia	39,840	42,920	3,080	7.7	13,630	16,410	2,780	20.3	310	346	36	11.6	53,780	59,676	5,896	10.7
Virginia	84,420	105,450	21,030	25.0	8,620	11,840	3,220	37.4	6,260	7,174	914	14.5	99,300	124,464	25,164	25.4
West Virginia	60,790	72,990	12,200	20.0	14,060	16,850	2,790	19.8	2,730	3,224	494	16.4	77,580	93,064	15,484	20.0
North Carolina	80,860	100,066	19,206	23.7	23,710	26,440	2,730	11.5	4,290	5,118	828	19.2	108,860	131,624	22,764	20.8
South Carolina	51,900	61,530	9,630	18.4	12,520	15,300	2,780	22.2	1,760	2,427	667	38.0	66,180	79,257	13,077	19.8
Georgia	96,480	116,610	20,130	20.8	23,170	26,480	3,310	14.2	5,600	6,384	784	14.0	125,250	149,474	24,224	19.4
Florida	83,460	113,860	30,400	36.4	18,810	22,460	3,650	19.4	2,850	3,285	435	15.2	105,120	139,605	34,485	32.7
East North Central																
Ohio	727,160	838,320	111,160	15.4	109,790	124,880	15,090	20.8	21,920	24,272	2,352	10.8	858,870	987,472	128,602	15.0
Indiana	324,210	368,000	43,790	13.4	53,670	60,260	6,590	12.2	21,260	24,475	3,215	15.1	399,140	452,735	53,595	13.7
Illinois	1,001,060	1,115,280	114,220	11.4	184,600	211,550	26,950	14.5	30,230	35,966	5,736	18.9	1,215,890	1,362,796	146,906	12.2
Michigan	478,140	604,810	126,670	26.3	84,100	106,150	22,050	26.3	20,130	22,023	1,893	10.2	582,370	732,983	150,613	26.0
Wisconsin	231,270	285,220	53,950	23.3	50,900	59,020	8,120	15.8	14,960	17,432	2,472	16.6	297,130	361,672	64,542	21.5
West North Central																
Minnesota	292,790	321,490	28,700	9.8	56,250	59,020	2,770	5.0	12,920	16,160	3,240	25.0	361,960	396,670	34,710	9.6
Iowa	198,200	232,030	33,830	17.0	44,490	50,710	6,220	13.9	9,480	11,630	2,150	22.6	252,170	294,370	42,200	16.7
Missouri	306,210	394,830	88,620	29.0	57,800	73,920	16,120	27.8	13,100	17,365	4,265	32.6	377,110	486,115	109,005	28.8
North Dakota	19,120	24,750	5,630	29.5	3,510	4,680	1,170	33.5	1,320	1,924	604	45.5	23,950	31,354	7,404	30.8
South Dakota	34,990	42,470	7,480	21.3	6,310	8,280	1,970	31.2	2,220	2,948	728	32.6	43,520	53,698	10,178	23.4
Nebraska	101,240	117,437	16,197	16.0	17,680	21,110	3,430	19.5	4,620	5,517	897	19.5	123,540	144,064	20,524	16.6
Kansas	181,540	201,600	20,060	11.1	29,910	33,380	3,470	11.7	6,510	7,080	570	8.8	217,960	242,060	24,100	11.1
East South Central																
Kentucky	87,690	121,530	33,840	38.5	17,780	26,720	8,940	50.2	4,510	7,008	2,498	55.3	109,980	155,258	45,278	41.0
Tennessee	93,550	125,900	32,350	34.5	16,660	22,820	6,160	37.0	4,260	6,899	2,639	62.0	114,470	155,619	41,149	35.8
Alabama	80,810	91,470	10,660	13.1	14,190	15,275	1,085	7.7	3,010	3,331	321	10.6	98,010	110,076	12,066	12.2
Mississippi	32,770	38,720	5,950	18.3	6,620	8,510	1,840	28.5	1,670	2,568	898	53.8	41,060	49,798	8,738	21.5
West South Central																
Arkansas	74,530	84,670	10,140	13.6	14,080	15,260	1,180	8.3	2,260	2,490	230	10.1	90,870	102,420	11,550	12.5
Louisiana	71,880	84,510	12,630	17.5	16,920	21,050	4,130	24.4	3,360	4,320	960	28.5	92,160	109,880	17,720	19.3
Oklahoma	121,130	140,860	19,730	16.2	18,760	22,330	3,570	19.2	9,120	11,276	2,156	23.7	149,010	174,466	25,456	17.2
Texas	363,380	410,990	47,610	13.2	50,980	63,280	12,300	24.2	9,870	14,739	4,869	44.6	424,230	489,009	64,779	15.4
Mountain																
Montana	49,610	56,210	6,600	13.2	10,250	11,510	1,260	12.3	4,720	6,427	1,707	36.4	64,580	74,147	9,567	14.9
Idaho	43,020	45,250	2,230	5.1	10,110	10,370	260	2.5	1,570	1,788	218	13.8	54,700	57,408	2,708	5.2
Wyoming	23,700	25,710	2,010	8.4	3,350	4,500	1,150	34.3	860	1,124	264	30.7	27,910	31,334	3,424	12.2
Colorado	125,530	138,640	13,110	10.4	17,360	20,230	2,870	16.5	6,420	7,238	818	12.7	149,310	166,108	16,798	11.2
New Mexico	16,830	18,380	1,550	9.2	2,900	3,110	210	7.2	650	828	178	27.4	20,380	22,318	1,938	9.5
Arizona	20,610	25,670	5,060	24.5	3,160	4,460	1,300	41.1	1,280	1,361	81	6.3	25,050	31,491	6,441	25.7
Utah	85,470	96,280	10,810	12.7	9,860	10,180	320	3.4	1,940	2,260	320	16.4	97,270	108,720	11,450	11.8
Nevada	13,430	13,780	350	2.6	2,450	2,720	270	11.0	460	510	50	10.8	16,340	17,010	670	4.1
Pacific																
Washington	209,390	234,160	24,770	11.8	33,130	36,520	3,390	10.2	10,810	12,200	1,390	12.8	253,330	282,880	29,550	11.5
Oregon	103,310	117,540	14,230	13.8	18,460	23,570	5,110	27.6	6,830	9,131	2,301	33.7	128,600	150,241	21,641	16.7
California	746,220	917,310	171,090	22.9	168,940	199,570	30,630	18.1	65,540	76,836	11,296	17.2	980,700	1,183,714	211,014	21.5

30 Years of the Power-Factor Problem

Devices Essential to Its Satisfactory Solution Have Been Developed and Are Now at Hand—Their Application Rests with the Electric Public Utilities

By W. A. LAYMAN
President Wagner Electric Corporation

THERE are a number of astonishing features connected with the power-factor problem. It has existed for thirty years, and yet we are still trying to define it in simple terms understandable to the general public. It involves serious questions of finance and executive management, and yet it is isolated in the engineering ward of our electrical hospital. Other great problems of the alternating-current system of distribution have been energetically attacked and solved, and yet this has persisted for thirty years, relatively untouched by the march of electrical progress. It is the caudal appendage of the industry, inevitable in our earlier stages of evolution, but now unnecessary, yet persistently trailing us, unsightly, bothersome, destructive, costly.

With some of us this problem has been an ever-present, inescapable nightmare. I came into the industry at the time the large alternating-current plants were beginning to give twenty-four-hour service—then limited practically to incandescent lighting. At once "magnetizing current" (we called it "leakage" current then) of distribution transformers became a serious operating consideration. To me was assigned the task of designing and testing transformers with smaller "leakage current." The inadequacy, by the way, of the terms we have applied to this phenomenon ("leakage" current, "idle" current and so on), their inaccuracy from the strict engineering point of view, has been one of the symptoms and also one of the causes of the persistence of the problem.

Our principal customer, the old Missouri Light & Power Company of St. Louis, imperatively demanded better transformers from the standpoint of "leakage" current. Most of this company's generating units were of 125 kw. capacity each, and two or three of these units were operated at times with full-load current during daylight hours, although the actual energy load was insignificant. The leading manufacturing companies responded aggressively with better transformers, and the transformer art progressed rapidly to a fairly comparable stage with the excellent apparatus of today.

PROBLEMS BROUGHT BY TWENTY-FOUR-HOUR SERVICE

Next in evolution came the unexpected preponderance of the day load over the night load, with the necessity for expanding generating capacity for daylight rather than for night-time service. It soon became obvious to the engineer devoting part of his time to central-station operation and part to the manufacture of electrical equipment that the designer's task had shifted from the production of better transformers to the design of better motors. The magnetizing current of the alternating-current motor became a far more important factor than that of the transformer had ever been. But the motor designer had nothing to offer.

William Stanley, one of the industry's early geniuses, attempted to market two-phase and three-phase motors with accompanying auxiliary static condensers, but the condensers were fragile. Section by section they broke down and the motor drifted back to its fundamental low power factor. The intention was good, but the result was to confirm the central-station world in its belief in the inevitability of low-power-factor motors.

In time came the rotary converter, and it was found

More than Two Million Customers Added Last Year

THE basic reason for the 21 per cent increase in central-station output which was reported last January for the year 1923, and for the present increased monthly revenue despite a material decrease in energy consumption by industrial customers, is to be found in the record growth and number of customers added to the central-station lines last year. Based upon a country-wide survey which the ELECTRICAL WORLD has just completed to ascertain the number of central-station customers of the various classes by counties, it is estimated that a total of 2,185,377 customers of all classes were added to the central-station lines during 1923. This is by far the greatest number of customers ever added during one year and is an increase of 17.7 per cent over the total number estimated for January 1, 1923. The reports indicated that there were on January 1, 1924, a total of 14,520,097 customers. Of this total 11,724,023, or 80.7 per cent, were domestic lighting customers; 2,262,755, or 15.6 per cent, were commercial lighting customers, and 533,319, or 3.7 per cent, were industrial power customers. The figures for both January 1, 1923, and January 1, 1924, were checked by companies operating in the various counties, a separate return being made for each county, and the resulting totals are believed to represent the central-station field of activity with a fair amount of accuracy.

The greatest numerical growth during 1923 appears to have taken place in California with a total of 213,016 new customers, an annual growth of 21.7 per cent. The largest growth in residential customers, however, was reported by Pennsylvania with 186,140, followed by California with 171,090. The East North Central States reported by far the greatest number of new customers with 544,258, but the percentage of growth of 16.4 was slightly below the average growth for the country as a whole. The East South Central States reported the highest percentage growth with 29.5.

that in addition to its designed service it was capable of offsetting, in the circuit as a whole, the bad effects of the poor power factor of motor load.

The conventional form of synchronous motor was also improved so as to be useful in the same way. My own company, about fifteen years ago, proposed a unity-power-factor type of single-phase motor, but it was high in price compared with the conventional types; central-station rate schedules offered no inducement to its introduction, and it languished as a commercial product. The hunt for corrective means outside the motor, applicable on the circuit, resulted in the advent of the synchronous condenser, employed solely for power-factor correction.

But all these devices were only palliative. The power-factor problem has come down the years substantially unsolved. A number of operating engineers have cried out for relief, but the manufacturer of the chief offender—the alternating-current induction motor—has discreetly kept in the background, disclaiming responsibility and offering no solution. No wonder the central-station industry as a whole has slept upon the situation.

THE CHALLENGE TO MOTOR MANUFACTURERS

But when a business such as the electrical began to require unbelievable sums of money for expansion and realized that a very substantial percentage of all this capital was by-passing down the magnetizing current chute; when it found the problem of uniformly good distribution service reaching staggering complexity, with this complexity tremendously magnified by the drag of heavy magnetizing currents for motors; when operating costs much in excess of the otherwise essential costs of production and distribution began to appear, it was not surprising that the time came when the National Electric Light Association demanded that the power-factor problem be solved.

In 1921 the Technical Section of the association, at the Chicago convention, adopted a resolution recommending:

"That the incoming administration endeavor to have all induction motors hereafter manufactured compensated for lagging currents, this compensation to be capable of being varied to suit the loading conditions of the motor so that a power-factor approximating unity may be obtained."

The "incoming administration" through H. L. Wallau, chairman of the apparatus committee, addressed the following letter to all the motor manufacturers of the United States:

December 12, 1921.

DEAR SIR:—I have been instructed by the electrical apparatus committee of the National Electric Light Association to take up with the motor manufacturers the question of the production of alternating-current motors with higher power factors at full and fractional loads.

The subject is a vital one to the supply companies, the power factor of whose systems is gradually decreasing with increase of industrial loads, due to the large number of installations consisting of but a few motors of small capacity and generally operated well below rating.

Because of their small size it is not commercial to install power-factor metering devices on these average installations, and therefore a penalty clause for low power factor cannot be applied.

The only remaining remedy is to set a minimum power factor below which an installation will not be served. This means a tendency to slow up growth unless there are on the market in all sizes [motors] the use of which will meet the power company's requirements.

As such a rule is being seriously considered by one of the largest companies, and its enforcement in the near future is very probable, those manufacturers whose lines have been developed with high power factor in view will undoubtedly be in a fortunate position.

Whether the improvement in power factor is to be obtained through change in present design, or by the use of present motors combined with static condensers, or through both, is, of course, a problem for the manufacturer.

Nor is a gain of 1 or 2 per cent worth while. A preferable solution would be a combination of motor and condenser such that approximately unity power factor will be obtained over all ranges of load.

Will you kindly direct the attention of your engineers to this subject and let me have your views on the matter not later than January 9, 1922?

Yours very truly,

H. L. WALLAU,
Chairman Sub-committee on Motors, Electrical Apparatus Committee, National Electric Light Association.

This was indeed a challenge to the motor-producing branch of the industry. Some of the companies immediately placed emphasis upon the improvement of static condensers. Others added increased emphasis to the improvement of the conventional form of synchronous motor. Operating engineers began the much larger use of the synchronous condenser.

The company with which I am identified attempted to go to the principal source of the trouble—the induction motor itself—and see if it could not be made self-magnetizing. The Fynn-Weichsel motor, whose practicability is now definitely demonstrated, is the product of these investigations.

The engineers have now done their part and forced the method of a solution of the power-factor problem to the surface. The application is largely still to come. The devices essential to complete power-factor correction are at hand. The burden of solution is shifted from the manufacturer to the commercial division of the central station.

HOW A SOLUTION MAY BE EFFECTED

It seems to me as an interested onlooker that several moves are possible which will accelerate the solution.

1. Give up the effort to explain the phrase "power factor" to the public and follow C. F. Scott's recommendation, to talk "magnetizing current" only. It seems simple to explain to the central-station customer that the necessary supply of magnetizing current can be obtained on his own premises more efficiently and economically than by burdening the distribution system with its transmission, and that the cost of supplying it should be divided between the customer and the central station.

2. Formulate a sound principle of rate making which inherently places a premium on the reduction of magnetizing current on the customer's premises and eliminates all necessity for the discussion of bonus and penalty clauses. In other words, let the rate do the talking. A number of central-station commercial men have expressed the opinion that a kva. rather than a kw. demand rate has at least great possibilities.

3. Is it not a principle that can and should be established, that the central station cannot permit the magnetizing current of one customer to interfere with good service to adjacent customers? It seems that if it is logical to rule heavy starting currents which temporarily disturb good regulation off the system, it is equally logical to rule off heavy magnetizing currents which continuously impair good regulation.

4. Cannot all parties interested in the problem agree

that the capital cost of elimination of magnetizing current belongs in part to the customer, because (a) he will reap advantages in internal improvement of plant operation, and (b) an investment obligation rests upon him to prevent the interference of his load with service to other central-station customers in the immediate neighborhood; and in part to the central station, because (c) elimination of magnetizing current reduces the capital investment per kilowatt of energy sold; (d) greatly reduces the energy losses in distribution, and (e) reduces the cost of maintaining good system regulation.

I recently heard a central-station executive put his views on this problem in about the following words:

"We've been talking about this power-factor problem for a long time. I'm going to find out just what it is. We've got some of this 'magnetizing' current on our system. How much? A certain amount of our capital investment is non-productively employed in carrying this magnetizing curent. How much? We're losing a certain amount of energy in our distribution system in distributing this magnetizing current. How much?

"They tell me that we can give better service to the public if we get rid of this magnetizing current. In what ways, and how much better? I'm going to ask my engineers for the facts in hard, cold figures in respect to our system, and if they're as bad as some of you gentlemen say, and the possibilities of better service as important as you say, we're going to get busy and get rid of this power-factor problem on our system."

Such a spirit will soon set the pace in the industry, and as it becomes common a few more years will see the problem dead and buried.

Letters from Our Readers

Recommends Award to Every Participant in Home-Lighting Educational Contest

To the Editors of the ELECTRICAL WORLD:

The national home-lighting educational contest is proving to be one of the greatest and most successful movements the electrical industry ever started. Its after-effects are going to be felt for a long time, and this makes it important that we leave no stone unturned to insure that this aftermath shall in no case be injurious. I have in mind the thousands of children who will turn in completed primers and essays and who, in the very nature of things, cannot get a regular prize. Their good will is worth retaining. Should we not provide locally some small token to be given to all such children?

The nation, as a whole, shows a surprisingly high percentage of communities organized and conducting contests. This means hundreds of thousands of children with aroused hopes. And I, personally, believe it would be a most advisable move on the part of every local committee to provide, in addition to the national and the local prizes and even the "honorable mention" medals proposed in some places, some little reward or gift for every child who turns in a completed primer or essay. It is a good "follow-up," and every child thus treated becomes, with his family, just so much more in the "booster" column.

The cost of such a plan is very small. I believe it should not be advertised or announced ahead of time. When other prizes are awarded, merely send some little "prize" or gift, with an appropriately worded letter, to all who have not won regular prizes. There are many such prizes that may suggest themselves. For example, the Society for Electrical Development has made arrangements to furnish attractive refillable pencils to companies at nominal cost. On such pencils a line can be printed with the local company's name or "Home-Lighting Contest."

I strongly recommend the consideration of this suggestion by all local committees.

JOHN F. GILCHRIST.

Chicago, Ill.

Dr. Kennelly on the Centenary Celebration of the Franklin Institute

To the Editors of the ELECTRICAL WORLD:

As the ELECTRICAL WORLD has already recorded, a very notable celebration has recently been held in Philadelphia on the centennial anniversary of the founding of the Franklin Institute. That institute was founded on February 5, 1824, in honor of the renowned printer, philosopher, inventor and statesman Benjamin Franklin. At that date Philadelphia was the most populous city in the United States. The census of 1820 assigned to it a population of 121,000, about 5,000 greater than that of New York.

During its hundred years of activity the Franklin Institute has maintained an honored place as a center of learning in the arts and applied sciences of this country. It has maintained classes of instruction, lecture courses, committees on invention and on science, a fine library, and medals of award for inventions and discovery. It has also taken part in several exhibitions held at Philadelphia. Its service rolls of officers contain a long list of illustrious names, and, as the ELECTRICAL WORLD has mentioned, its present president, Dr. William C. L. Eglin, belongs to the electric light and power industry.

The celebration exercises occupied three days (September 17-19), and the meetings were held at the Franklin Institute building, the Walnut-Street Theater, the Bellevue-Stratford Hotel, the University of Pennsylvania, the Bartol Research Foundation and the Academy of Natural Sciences. Representatives were present from 109 home and foreign universities, as well as from ninety-six learned and professional societies and ninety-seven industrial organizations. The chief historical address was by the chairman of the honorary committee, Prof. Elihu Thomson, who was able to give many important historical facts concerning the work and achievements of the institute from his own personal experiences. Forty-eight addresses and papers were read by delegates from this and other countries, all of which are to be printed in a memorial volume published for the event.

The proceedings were brought to a close by a banquet in which about five hundred persons took part. After the banquet the memorial scrolls and diplomas were handed in from the numerous learned societies and institutions represented. The proceedings reflected great credit upon the officers in charge of the program, and the occasion will long be memorable in the annals of Philadelphia.

A. E. KENNELLY.

Pierce Hall, Harvard University,
Cambridge, Mass.

Central Station and Industrial Practice

Mercury Rectifier Operates 45,766 Hours

WHAT is believed to be an exceptionally long operating life for a mercury rectifying tube is reported at the Camp Washington substation of the Union Gas & Electric Company, Cincinnati. This tube was received May 23, 1911, and has been in almost constant service since. On July 23, 1924, its life was figured at 45,766 hours and 58 minutes.

The municipal arc lamps in Cincinnati are connected in series and operate on direct current. They are fed through constant-current transformers, each equipped with two mercury-arc rectifying tubes. This tube was used in one rectifier circuit until May 25, 1921, when it was reported to have caused flickering of the street lights. The total active life of the tube at that time was 39,189 hours and 37 minutes. The trouble was only temporary; but on February 9, 1922, it was placed in another circuit, where it has been rendering perfect service since.

AVERAGE LIFE OF RECTIFIER TUBES

Year	Hours	Year	Hours
1915	2,553.00	1920	4,145.39
1916	2,809.60	1921	4,170.77
1917	3,195.41	1922	4,428.63
1918	4,124.32	1923	5,187.25
1919	4,476.58		

The exceptionally long life of this mercury tube may be seen from the average life of tubes that have broken since 1915 as given in the accompanying table.

Engineering Course for Operating Force

AN INSISTENT demand for information and instruction has been found among the operating and engineering forces of the Texas Power & Light Company, Dallas, manifesting itself particularly in the distribution department. After several months of personal study of the working conditions of all departments it was decided that direct good could be accomplished by bringing the line superintendents and foremen together, since they have to deal with and are directly responsible for the construction, maintenance and operation of the physical plant and in view of the accounting responsibility that attaches to their positions. A foreman, it was appreciated, would be only half qualified if he knew only the construction end of his work and nothing of the accounting features connected with it.

It was decided to give the distribution foremen a week of general instruction in a "get-together" meeting last May. The benefit of that week's work is now being reflected in work orders and general reports. With this benefit in mind and urged by numerous requests from employees, the engineering department is now outlining a course of study which is to be a combination of correspondence and local school for the benefit of its members.

Questionnaires are being mailed to all employees of the Texas Power & Light Company and affiliated companies requesting them to state the nature of the work or subjects in which they are most interested. Any subject selected for instruction will be presented in the most practical way, with due thought to the preliminary training leading up to the work. The courses will not be compulsory.

Transformer Inspection Practice

TO SYSTEMATIZE the practice of maintaining transformers and to co-ordinate methods of inspection and record of this class of equipment, the Worcester (Mass.) Electric Light Company has formulated instructions as to procedure. These are given below through the courtesy of George M. Hardy, general superintendent:

The service engineer shall be responsible for the proper inspection of all transformers, except pole-type distribution transformers of 25 kw. or less, located on poles, structures, or on the ground near poles, in which case the distribution engineer shall be responsible for the proper inspection which shall be made by the line inspector in connection with his general inspection of poles, lines, etc., but the service engineer shall indicate which of these transformers are to be inspected. The service engineer shall be responsible for the proper treatment of all transformers reported as defective or in need of repairs. He shall also be responsible for the maintenance of the proper office records of all transformer inspections. The chief clerk of the service department when requested shall furnish the necessary clerical assistance for the accomplishment of this work.

Distribution Transformers. — Every distribution transformer in service shall be inspected once in every five

THE WORCESTER ELECTRIC LIGHT CO.
TRANSFORMER INSPECTION ORDER

Street		Water in oil	Yes / No
Block No.		Oil	At proper level / ..... inches below level mark
Plate Map No.		Condition of Interior	Good / Poor
Pole: Old No.	New No.	Condition of Gasket	Good / Poor
Company No.	Kw.	Primary Fuse Box	Old Iron / Porcelain
Connection	2 wire / 3 wire	Fused with copper wire No.	
Volts: Prim.	Sec.	Condition of Primary leads	Good / Poor
Well hung	Yes / No	Condition of Sec. leads	Good / Poor
Remarks:		Condition of Bushings	Good / Poor

Date Inspected.....192..... Inspector.....

DETAILED TRANSFORMER INSPECTION ORDER USED BY THE WORCESTER ELECTRIC LIGHT COMPANY

years. Three weeks before the line inspector is ready to start inspecting transformers he shall notify the service engineer, who shall supply the line inspector with a "transformer inspection order" for each transformer which he is to inspect (see accompanying illustration). The information for this order shall be obtained from the "transformer load card."

The line inspector shall add to the transformer inspection order any necessary details concerning the location of the transformer which he may obtain from the pole record and plate maps. He shall take the inspection order into the field and proceed to carry out the following instructions, noting the results on the card:

1. Check the name-plate data.
2. Remove cover and observe whether there is odor of burned insulation or other indication of overload or lightning damage.
3. Examine the felt gasket under the cover and note whether it is in good condition.
4. Note whether oil is at its proper level. If not, note how many inches the surface of the oil falls below the oil level mark.
5. Replace cover and make certain that there are no bolts missing.
6. Test for water in the oil as follows: Open the oil plug and collect a small sample of oil on a piece of tin or other bright smooth metal. If any water is present in the oil, it will be visible in the form of small globules at the bottom of the oil.
7. Inspect the primary and secondary leads and bushings both inside and outside of the transformer, and if the insulation is in such poor condition that there is danger of a breakdown to the case, or if the bushings are badly cracked or broken, report the transformer as "Should be changed." Make sure that the leads do not touch the case inside the transformer.
8. If fed from an underground connection, examine the primary leads at the top of the standpipe.
9. Make certain that there are no power customers on the transformer, or if there are such customers, inform them that their power will be off for a few minutes; then, if possible, inspect the primary fuses and renew them with copper wire of the proper size if necessary, according to the accompanying table.

SIZE OF FUSES FOR DISTRIBUTION TRANSFORMERS

Primary Volts	Kva. Capacity	Wire Size No.
2,200	0.6-7.5	22
2,200	10-20	20
2,200	20-37.5	18
2,200	37.5-50	16
4,400	All sizes	26

10. Examine the manner in which the transformer is attached to the pole. Note whether it rests in a vertical position, and also note any unusual conditions which might result in trouble of any kind.

The line inspector shall give the inspection report cards to the engineering assistant to the distribution engineer, who shall look them over and make note of any special information which requires his attention (as broken poles, incorrect pole numbers, etc.), then give them to the service engineer.

The service engineer shall see to it that all defective transformers are repaired or replaced, and that the date and the result of the inspection is entered on the reverse side of the corresponding transformer load card.

All transformer inspection orders which apply to subway transformers shall be given by the service engineer to the transformer repair men. The transformer repair men shall, with the assistance of a jointer, make the inspection and report to the service engineer. The service engineer shall attend to any necessary repairs and records, as in case of the overhead transformers. The general line foreman shall assign a jointer for this work upon request of the service engineer.

Nevada Plant's Experience with Diesel Engines

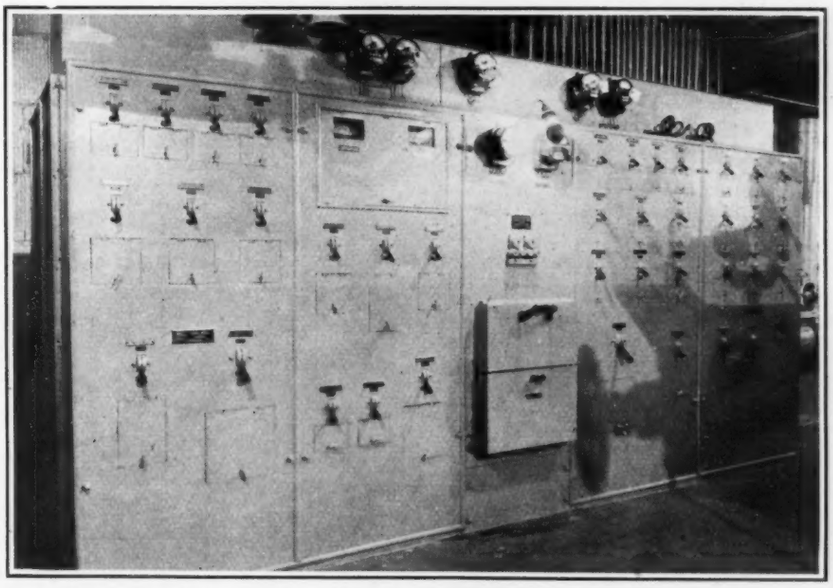
EXPERIENCE with a type 4-B-90 Busch-Sulzer Diesel engine has been submitted by B. G. McBride, manager of the Elko-Lamoille Power Company, Elko, Nev., which, while it does not give all the information that existing or prospective Diesel engine users would like to have, is, nevertheless, interesting. The engine, which is rated at 360 hp., is employed along with another rated at 250 hp. to serve as a booster for a hydro-electric plant containing a 450-hp. waterwheel. Because of the infrequent use of the Diesel engine no daily log sheets are kept. The plant serves a population of about 3,000, with 861 meters and a power load of about 150 hp.

The report from the general manager says that the engine will carry 250 kw. continuously without trouble or smoke in the exhaust. Under favorable conditions, when the valves are in good condition, the engine will carry 275 kw. with clear exhaust. The maximum load it has ever carried with very little smoke in the exhaust is 300 kw Normally the barometer at Elko stands at 24.50 in. When it falls below 24 in. there is a noticeable difference in the carrying power of the engine.

The average fuel consumption for the past five months has been 0.0955 gal. per kilowatt-hour, the oil being measured in the tank and not including allowance for water, temperature, leakage, etc. During one period, when Diesel-engine oil with a specific gravity of +24 Baumé was being used and when there were approximately one hundred occasions for starting with a cold engine, the fuel consumption was 0.1 gal. per kilowatt-hour, based on tank-car measurements. During the period for which these data apply the total fuel consumption was 20,000 gal.

On the average, about 2,100 hp.-hr. can be developed per gallon of lubricating oil without using an oil separator, according to Mr. McBride. Lately an oil separator has been installed, and it is expected to make a considerable saving and also to re-

Dead-Front Switchboard Installed in Bank Building



SAFETY regulations in California require the installation of protected industrial switchboards of this type. The board shown in the accompanying illustration presents a very neat appearance and is a good example of an installation of this type. This switchboard is installed in the new Anglo-London-Paris National Bank in San Francisco.

claim some of the oil now on hand. Several grades of oil have been used —Calol Diesel engine oil (heavy) from the Standard Oil Company, Ursa No. 555 from the Texas Oil Company and heavy Union Diesel engine oil from the Union Oil Company. The latter is a blended oil, consisting of about 40 per cent Eastern base and 60 per cent Western base. Considering the price of this oil, it has been found the most satisfactory. Union "Red Line" compressor oil, which is a straight-run paraffine-base oil, has been found superior to several other oils which have been tried. About 5,000 gal. of shale-fuel oil has been used with excellent performance of the engine both as to clean-burning and fuel consumption.

On many occasions, owing to the Diesel engine unit being kept as a reserve, it has had to be left standing for a week or ten days without turning over. On one occasion it remained standing for thirty-seven days and yet was started without taking any unusual precautions and as easily as though it had been running every day. Mr. McBride reports that the engine has never given any trouble since its initial turnover in spite of the fact that it has often been necessary to start with an engine-room temperature of about 45 deg. F. and with a thick layer of ice on the cooling pond. Up to the present compressed air has always been available for starting.

The only money spent for maintenance to date has been for a spare valve cage, gaskets and a set of metallic packing for the fuel pump, and to renew four piston rings which were broken rather than take the time to loosen up the top ring of each piston which was stuck.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Meter Installations and Line Crossings

ONE watt-hour meter shall be installed for lighting or power service. In arranging service to the customer the number of service connections and metering points shall be limited to one service for power and one service for lighting if possible. Lighting circuits taken off power service at a different voltage from the power should, in general, be separately metered.

Size and Use of Meters.—The size of meters required for various loads is given in Table XXIII. It is important to choose meter capacities which most nearly take care of the average load. It is better practice to under-meter than to over-meter an installation. Where extensive alteration or additions are being made to existing installations, they shall be brought up to the standards for new installations.

All alternating-current watt-hour meters (of the West Penn system) up to and including 50 amp. (single-phase two-wire, single-phase three-wire and polyphase) for 115 volts, 230 volts or 460 volts are self-contained and will not require current transformers. Higher-capacity meters for 115 volts, 230 volts or 460 volts will require current transformers. All meters for currents above 460 volts will require both current and potential transformers.

CROSSINGS

Over Railroads.—For any crossing over a steam railroad or electric interurban railroad complete information shall be given on the estimate covering the crossing. This should include a sketch showing the exact location of the crossing with reference to a railroad milepost, depot, culvert or bridge and also the contour of the ground, height of rails, telegraph wires, etc. If the crossing poles are to be set upon any highway, street or alley use of which is permitted by franchises, the location will generally be sufficiently exact if given with respect to the distance from the boundary line of such highway, street or alley. If the crossing is to be located on private property, it will usually be necessary to make a survey to determine the exact location before notifying the railroad company. All crossing construction shall be in strict accordance with the prints accompanying individual work orders.

Over Telephone, Telegraph or Signal Lines.—For any crossing over telephone, telegraph or signal lines outside the corporate limits of boroughs or cities, complete information shall be given on the estimate covering such crossing. This should include a sketch showing exact location of the crossing and the numbers and height of the foreign poles supporting the span to be crossed.

TABLE XXIII—LOAD IN KILOVOLT-AMPERES FOR FULL CAPACITY OF METERS

Size	Single-Phase			Three-Phase					Direct-Current, Two-Wire
	Two-Wire		Three-Wire						
Amp.	115 Volts	230 Volts	115-230 Volts	230 Volts	460 Volts	2,300 Volts	6,900 Volts	25,000 Volts	650 Volts
5	0.6	1.2	.....	2.3	4.6	23	69	250	3.3
10	1.2	2.3	.....	4.6	9.2	46	138	500	6.5
15	1.7	3.5	3.5	6.9	13.8	69	207	750	9.8
25	2.9	5.8	5.8	11.5	23.0	115	345	1,250	16.3
50	...	11.5	11.5	23.0	46.0	230	690	2,500	32.5
	Above meters are self-contained								
75	...	17.3	17.3	34.5	69.0	345	1,035	3,750	48.8
100	...	...	23.0	46.0	92.0	460	1,380	5,000	65.0
150	...	...	34.5	69.0	138.0	690	2,070	7,500	97.5
200	...	...	46.0	92	184	920	2,760	10,000	130
300	...	...	69	138	276	1,380	4,140	15,000	195
400	...	...	92	184	368	1,840	5,520	20,000	260
500	...	...	115	230	460	2,300	6,900	25,000	325
750	...	...	173	345	690	3,450	10,350	37,500	488
1,000	...	...	230	160	920	4,600	13,800	50,000	650
1,500	...	...	345	...	1,380	6,900	20,700	75,000	975
2,000	...	...	460	...	1,840	9,200	27,600	100,000	1,300
	Above meters need one current transformer		Above meters need one three-wire or two two-wire current transformers	Above meters need two current transformers		Above meters need two potential and two current transformers		Use high-tension metering equipment or two potential and two current transformers	Use shunts and external resistances as required for each make of meter

Where necessary to use two-phase meters the capacity is the same as shown above for three-phase meters of the same current and voltage ratings.

Size of Meter Required

	Per Cent of Connected Load
Residences, wholesale houses, elevators	35 to 50
Stores	75
Small stores, restaurants, single motors	100

Lowering Cable Failures by Good Construction

BY R. L. FRISBY
Electrical Engineer of Stations, Kansas City Power & Light Company, Kansas City, Mo.

THE cause of faults and breakdowns in high-voltage cable is always a live question and the basis for considerable speculation among operating engineers. The results of a cable failure are costly, not only from the standpoint of damaged apparatus but because of the long interruptions to service. Owing to the fact that all evidence is destroyed in the burn-out following the cable failure, it is hard to determine exactly what was the cause, though it is always clear that the value of

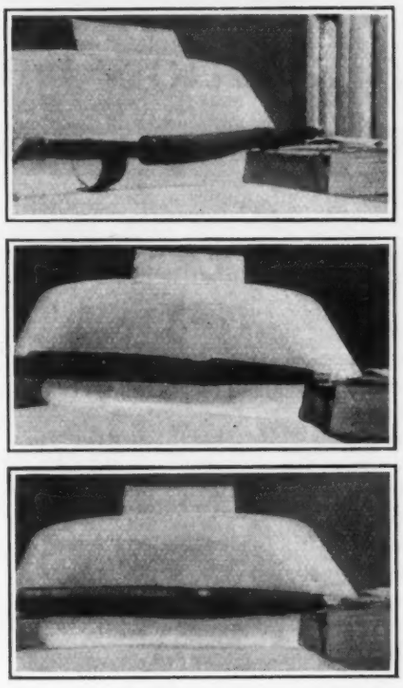
good construction cannot be overestimated.

Among the many causes for faults are hot spots, defective insulating material, moisture in joints and splices, voids or air spaces left between layers of tape, too much or not enough compound, static discharge at end of sheath or end of conduit run and excessive heating due to overloads.

A recent case of cable trouble in Kansas City, resulting in considerable damage to connected apparatus, was at first thought to be due to one of two causes—faulty insulating material or deterioration of the insulation from static discharge. Further investigation proved, however, that the failure could not be ascribed to any of the usual causes. The evidence was not all destroyed, as is clear from the photographs, and it was found to be simply a case of faulty construction. This is nothing new, but it is something which must be called to the attention of electrical construction men once in a while, and especially to that of the younger men starting in.

This particular case of trouble occurred on a standard make of cable made to the following specifications: 400,000-circ.mil., $\frac{7}{64}$-in. varnished cambric, 17,000 volts working pressure, 48,000 volts test pressure, double weatherproof braid, used on a 13,200-volt feeder service. A portion of the feeder was overhead construction with oxide-film arresters installed on a pole about 75 ft. from the station. The line was then carried underground into the station and equipped with 4 per cent reactors based on 400 amp. The reactors are shunted with standard resistors of approximately 3,000 ohms. Lightning struck the overhead section of the line and the potential surge passed the arrester and the reactor. The fault itself occurred on a short section of cable between the reactor and current transformer where the conductor passes through a reinforced-concrete slab bushed with a short piece of fiber conduit (Fig. 4).

When preparing this particular length of cable for lugs, one at each end, the workman in cutting back the weatherproof braid to pencil or taper the insulation had cut around the cable at an 8-deg. angle to the conductor. In doing so, instead of just cutting the braid, his knife cut and scored the insulation almost to the copper conductor. Removing a part of the insulation left a square



FIGS. 1-3—FAULTY REINSULATION CONSTRUCTION RESPONSIBLE FOR CABLE FAILURE

shoulder, as in Fig. 1. In finishing his work he built the taper or penciled end up to normal size, ending each layer of tape at the shoulder, and finally completed the job by two layers of tape on the braid portion of the cable. As a result he had about

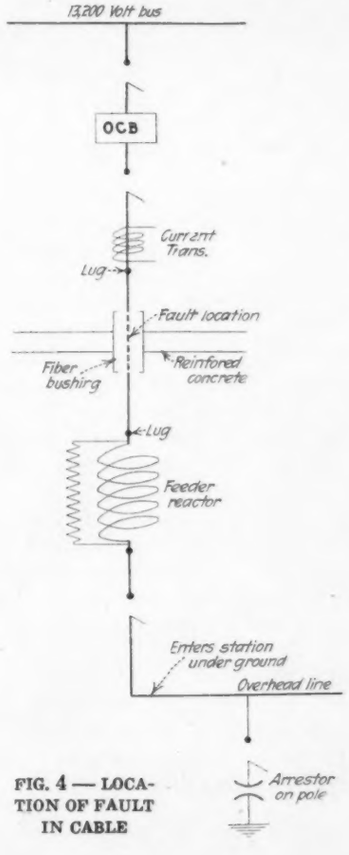


FIG. 4 — LOCATION OF FAULT IN CABLE

two good layers of tape next to the copper, an air space of approximately $\frac{3}{8}$ in. and two layers of tape on the outside.

This poor workmanship could not be detected by inspection of the finished work, and the initial high-potential test did not disclose the condition. The appearance of the cable after the burn-out is shown in Fig. 2, while Fig. 3 shows a view of the opposite side of the cable from the point where the insulation punctured, showing the cut in the insulation after the two outer layers of tape were removed. It is not unreasonable to presume that some of the faults which develop in cable splices may be due to work of this nature.

Annealing Process Work in Electric Ovens

EXCELLENT use of two 43-kw. Hoskins annealing ovens has been made by the Detroit Lubricator Company for annealing stamped and drawn brass hardened by process work. In internal dimensions this oven is 72 in. long and 24 in. square. The heating elements are installed on all four sides so that direct radiation is afforded the metal. An average of three heats an hour, each weighing 200 lb., will anneal about 16,200 lb. in a nine-hour day. The heating elements are composed of a nickel-chromium alloy, $\frac{1}{4}$ in. square. Although no automatic control is used, a greater uniformity of heat control is available than that obtained with the similar and adjacent annealing oven heated by gas. A Bristol recording pyrometer keeps the operators informed as to the correct temperature, which varies between 1,000 deg. and 1,150 deg. F.

As to the operating economy, no actual figures are available, since no separate meters were installed to determine this for these ovens. However, at the lowest energy rate of the factory, based on the total demand charges, 1.9 cents per kilowatt-hour, a rough estimate of the cost of annealing solely on the basis of energy consumed can be made. Assuming that the two 43-kw. furnaces operate during a nine-hour day and thus consume 774 kw.-hr., this divided into the total production of 16,200 lb. yields about 20 lb. of metal annealed per kilowatt-hour. This brings the cost per pound of metal annealed down to 0.095 cents. These two units are operated from a 220-volt, three-phase circuit.

Central Station Business

Northern States Customers' Service Bureau

TO IMPROVE and maintain good public relations the Northern States Power Company has recently created and put into operation a customers' service bureau whose business it is to make and hold friends for the company. At present the equipment used by the bureau in Minneapolis consists of four trucks, two gas and two electric. The men in charge make daily calls on the customers, carrying with them a supply of lamps for replacement purposes. This is the only equipment which the trucks carry. In addition, the company's representative is provided with a specially designed case, which contains one sample of each kind and size of lamp carried in the truck. This enables a customer to make an easy choice of the size or style of lamp he wants.

The customers' service bureau, as its name indicates, aims to improve the service rendered to consumers. Its objectives and the manner in which it functions may be described as follows:

1. To provide a convenient means for the customer to purchase lamps, thereby keeping all sockets full.

2. By a personal call from a representative of the company the customer is made to realize that the company is interested in providing the best kind of service and in maintaining the best possible relations.

3. The customer is invited to discuss any misunderstandings so that a proper "follow-up" may be made to correct such situations and eliminate possible antagonisms.

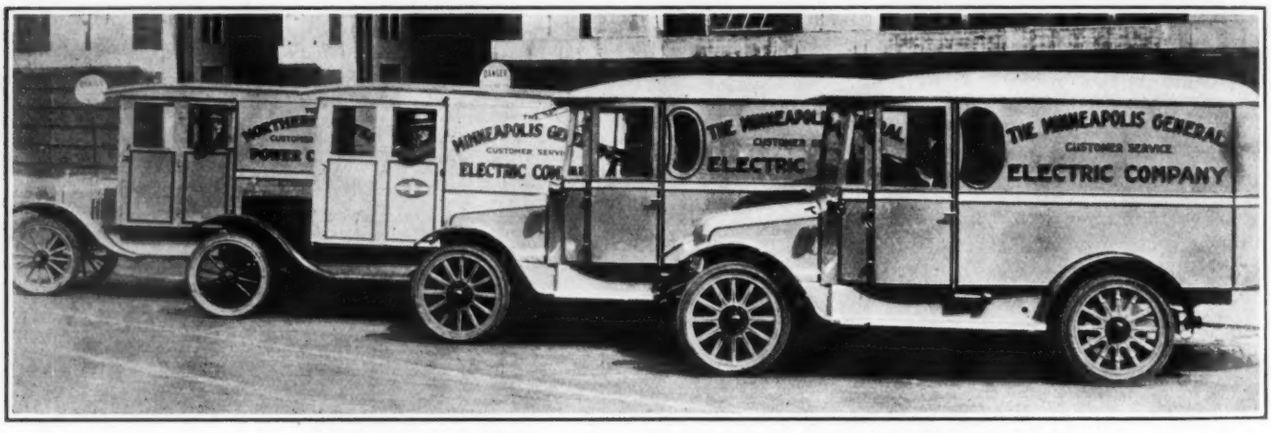
4. Inquiry is made as to the use of electrical appliances in the home, whether or not these are in good operating condition, what difficulties may be experienced in using them and what additional electrical appliances the customer would like to have. During the course of a day's work these men are asked every conceivable kind of question regarding electricity and are requested to do small jobs in the way of repairing cords, appliances, etc., thus giving the company an opportunity of placing all appliances in active service. The work along these lines is valuable not only to the customer by assisting him to obtain full use from all electrical appliances, but also to the company, to which it gives an active "prospect" list for the sale of additional appliances and increased use of energy in the home.

The work of these men is supplemented by other departments which take care of complaints on bills, rates and service, misunderstandings of any kind, appliances out of order, appliances not in use because customer fails to understand how to use them properly and additional appliances in which the customer may be interested. The work of this bureau, although of very short duration, has already proved of immense value in adding to the Northern States Power Company's quota of good will.

Getting Good Results from Linemen

SOME companies have been known to complain of the results they get from their linemen, while other companies are so well satisfied that they retain almost the same men in their line crews year in and year out. One company in the Southwest which has been particularly fortunate in its relations with linemen says that it merely tries to treat them in man-to-man fashion. While it does not believe that they are paid any more than linemen in other sections of the country working under similar conditions ($145 per month), they are paid full salary during sickness and receive two weeks' vacation with pay. Furthermore, if any man is injured in an accident for which he is not responsible, the company pays the difference between the amount which he receives as compensation insurance and his salary. Taking these benefits into consideration, the cost to the company of a lineman's services is about 75 cents an hour. The chief feature is that the men are appreciative of this company policy.

In addition, the linemen derive benefit from membership in the employee club organization, with which any employee can become affiliated by paying $1 a month dues, half of which goes to mutual insurance and 50 per cent to social purposes. Employees are asked to sign a slip permitting the company to deduct the



NORTHERN STATES POWER COMPANY'S FLEET OF CUSTOMERS' SERVICE TRUCKS

dues from their salaries, in this way protecting them against themselves for failure to pay their dues regularly. Through membership in this club employees receive $1 a day sick benefit and doctor's services at one-half to two-thirds of the regular fees charged. In addition, the club supports the practical nurses who visit all of the sick.

The employees also conduct a loan fund in which any employee can participate either as a borrower or as a capitalist seeking interest on his money.

Trend Away from Customer Deposits

IN NEW ENGLAND central-station circles there is at present a marked trend away from requiring customers seeking service to make cash deposits, many executives being of the opinion that better feeling is induced by assuming that a customer's credit is good than by requiring him virtually to prove this to be the case before receiving service. At the outset of this year the Edison Electric Illuminating Company of Boston reversed its former policy in this connection, and unless the applicant for service has a poor credit record with the collection department, he is now considered a good risk, his application is approved and he leaves the office with the best of feeling toward the company.

On December 31, 1923, there were 180,000 customers on the system, 33,000 of these being depositors to the extent of about $300,000. On August 1, 1924, there were 195,000 customers and only 22,000 depositors, with a total deposit of $215,000. In the early part of last year 38 per cent of the applicants for service were obliged to protect their accounts with a deposit, but at present only about 10 per cent of the applicants make a deposit and the greater part of these are commercial users. Other companies are coming more and more to this practice, and little or no increase in the number of bad debts has been noticed.

Increasing Residential Revenue

Central Station Gives Advisory Service for Home Lighting Which Results in Additional Connected Load of 200 to 300 Watts per Customer

LIGHTING campaigns of various types have been conducted in the southern district of the Hodenpyl-Hardy Company's properties which have been very effective in increasing revenue and at the same time developing more satisfied consumers. Usually the campaigns are conducted first on the system of the Central Illinois Light Company at Peoria, which is the headquarters of the southern district, and if successful there they are adapted for use in the other cities in this district, namely, Evansville, Ind.; Springfield, Ohio, and Springfield, Ill.

Following the kitchen-lighting campaign in Peoria, J. M. Shute, illuminating engineer of the southern district of the Hodenpyl-Hardy Company, says that a number of customers were found to be much interested in proper lighting for other rooms in their homes, but they seemed to have no idea as to where to obtain information. As a result of several inquiries a survey was made of 300 homes—100 class A, 100 class B and 100 class C. In the living rooms of the better class homes it was found that the number of sockets ranged all the way from twenty down to two, in the class B homes from thirteen to one, and in the class C homes from seven to one. The average number of sockets per living room was approximately five. The connected wattage ranged from 640 to 40, with an average of approximately 200. In dining rooms of the better-class homes the number of sockets ranged from twelve to a hundred, in the class B homes from nine to one and in the class C homes from five to one. The average number was a little better than three sockets, while the average wattage was 125, the actual wattage ranging from 375 down to 40.

Data obtained from the previous kitchen-lighting campaign showed that the average lamp removed from kitchens was rated at 55 watts and was replaced by a 150-watt "Mazda C" lamp and a daylight kitchen unit. Less than half of all the kitchens had a convenience outlet, only two out of three of the better-class homes and one out of four of the poorer-classes homes having convenience outlets of any type.

The foregoing information showed conclusively that there was a great possibility for increasing revenue by improving residence lighting if the customers could be educated along proper lines. As a result a definite plan was adopted.

FOLLOW-UP PLAN

Each week the building permits issued by the city are obtained, the ones pertaining to remodeling homes or building new homes are selected and a letter is sent to each of these "prospects." The results to date show that more than 10 per cent of them voluntarily request the lighting service offered. Others are called on the telephone and asked if they care to take advantage of the advisory service. The next step is to go over the plans with the customer, pointing out the advantages of convenience outlets for use of portable lamps or electrical appliances, of adequate wiring and of sufficient expenditure to warrant a good grade of lighting fixtures. Fixture catalogs displaying the types recommended are shown, assistance is given the customers in selecting the equipment, and information is furnished as to where the fixtures can be obtained and the price that will be charged.

In talking with the prospective customers it is recommended that 3 per cent of the money to be invested in the home be devoted to the electric service facilities and lighting equipment. In most cases there is very little difficulty in convincing the customer of the advisability of this expenditure. Up to date customers accepting this advisory service have been very much pleased with the results of the lighting installations, and they have in several instances expressed appreciation by letters. The greatest proof of the value of this service is in the act that customers so served have spoken of the service to friends, and they in turn in several instances have requested the advisory service without any solicitation from the electric service company.

Electrical dealers and contractors have been quick to recognize the advantage of this procedure and have been very willing to give all possible assistance. Furthermore, the experience with this advisory service has demonstrated to the organization of the utility company and other electrical interests the possibilities in residence lighting. For that reason no difficulty has been experienced in lining up the same interests for the

conduct of the national home-lighting essay contest, according to Mr. Shute.

To show the results obtained, a specific example may be cited. As shown in the accompanying illustrations, the living room was originally lighted by a five-lamp central ceiling fixture equipped with clear lamps and no diffusing medium of any kind. As indicated by the illustration, very harsh lighting effects were produced. As a result of the advice given, the occupants of the house equipped the central fixture with tinted glass-ball shades and 25-watt round-bulb frosted lamps and installed three convenience outlets for the connection of portable lamps. The duplex floor lamp utilizes one 150-watt bowl enamel lamp, and the bridge lamp and table each have one 50-watt white "Mazda" lamp. The load in this room is now 375 watts.

The dining room in the same house was equipped with a four-lamp shower fixture, using four 25-watt "Mazda B" lamps and "CRI" glass shades. This was replaced by a five-lamp candle fixture, using 25-watt round-bulb frosted lamps and glass shades. In addition, two electric candlesticks were placed on the buffet and connected to a convenience outlet in the wall. Each candlestick uses a 25-watt flame-shape lamp with a glass shield, corresponding to the shade on the central fixture. In this way the active load in the room has been increased 100 watts to 175 watts.

In the kitchen a daylight kitchen unit was installed, a 150-watt "Mazda C" lamp replacing a 60-watt "Mazda B" lamp on a combination gas and electric fixture.

Changes of a similar nature were made in the bedrooms. One bedroom having a central ceiling fixture with a 40-watt lamp in a prismatic glass shade was equipped with a newer-type fixture, using three 25-watt all-frosted lamps and two portable lamps, thus increasing the load from 40 watts to 175 watts.

As a result of these changes the connected load in this house was increased from approximately 700 watts to 1,500 watts. Lighting was improved and the customer was absolutely satisfied, although the average monthly consumption was increased 20 kw.-hr. and the monthly bill increased 60 cents, since this additional load was all in the low step of the rate. Thus the added annual revenue from this customer was approximately $7.20.

The foregoing example is typical of the many homes which have been served through this plan. The load, of course, is not always increased to the extent illustrated by the foregoing case, but figures obtained to date show an average increase of 200 to 300 watts with extremes of 100 and 900 watts.

REVENUE FROM THIS HOME WAS INCREASED $7.20 PER YEAR BY GIVING ADVICE ON IMPROVING LIGHTING

Left—The living room was originally equipped with a five-lamp cluster fixture equipped with bare 25-watt lamps. Note harsh lighting effect and glare. Above—Revised living-room lighting of shaded central clusters, portable and table lamps totaling 375 watts. Right—Four-lamp shower fixture replaced by five lamp candle luminaire and electric candles, 175 watts.

Improvement of Power Factor by a Kva. Rate

BY FRANK C. TAYLOR
Engineer Industrial Sales Department, Rochester Gas & Electric Corporation

THE central station's work is to deliver kilowatt-hours to its customers at as low a cost as possible consistently with good service and at a fair profit. It is also the duty of the central station to improve the efficiency of its system with the idea always in mind of lowering the cost per kilowatt-hour delivered. For this reason the kva. or power-factor rate is now occupying the attention of central-station men, for low power factor means but one thing — inefficiency. With low power factor more capacity in lines, transformers and generators is required to serve a given load in kilowatts than at unity power factor. In fact, the wattless kva. increases the losses and increases the investment necessary to serve a given kilowatt load.

It is, therefore, of great importance to a company to improve its system power factor, and in casting

about for ways and means of doing so it is only natural to turn to the rate schedule for help. In the past the rate schedule by offering a reduced rate for off-peak use of electricity has improved load curves and reduced the cost per kilowatt-hour generated. Why cannot some similar encouragement be offered to the customer to improve his power factor?

First, the following most common causes of low power factor should be considered: (1) Motors lightly loaded or any small low-speed motors; (2) underloaded transformers; (3) synchronous apparatus, through careless operation at a lagging power factor; (4) use of induction motors when synchronous motors could have been used.

The first situation is not easily remedied in the average plant. Motors are usually installed large enough for maximum production and are, therefore, lightly loaded in periods of business depression. The owner prefers to put in motors amply large for the work so that the motor will not fail and tie up a department, with resultant loss in labor and production. In fact, most plants add machines from time to time and want to be able to do so without having to replace the motor by a larger one. Improvement in power factor may be obtained in some plants by a rearrangement of the load on motors, but a complete remedy is not to be found here.

Must Investigate and Analyze Conditions

On most systems the causes of low power factor during the daytime—namely, 7 a.m. to 5 p.m.—have not been carefully investigated. It is only logical to suspect that because of their magnetizing current lighting transformers lightly loaded in the daytime make for low power factor. Oversized power transformers also cause low system power factor. The central station before definitely deciding on a remedy should find out the cause of the trouble.

The synchronous motors at present installed will never be operated to correct plant power factor until some incentive is offered in the form of a rate which provides some kind of bonus or reward for high power factor. Furthermore, before many new synchronous motors will be installed on equipment other than air or ammonia compressors the central-station company must give some incentive in its rates to encourage their installation by the plant owner.

What class of customers can improve their power factor at the least expense? The answer obviously is the larger customers in general. Large plants have motors driving air compressors, motor-generator sets and other large motors which could easily be of the synchronous type. In fact, some of the large customers already have synchronous motors on compressors, rotary converters and motor-generator sets. On giving such customers some reason, such as a rate reduction, for operating above a predetermined power factor, say 80 per cent, results quickly follow.

Economic Soundness

The central-station company in its eagerness for high power factor should not, however, load up its customers with a greater investment in excess synchronous equipment and with greater excess losses than it will save in investment in lines, transformers and generating equipment. Power-factor correction is only worth while and economically sound when a net saving is made.

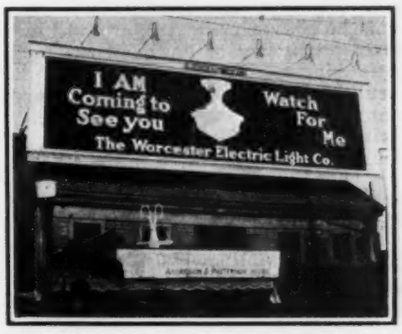
The kva. rate is undoubtedly the best method of encouraging the customer to improve his power factor. In this rate the demand charge is based on kilovolt-amperes rather than kilowatts, but otherwise the form of the rate may be the same as a three-part rate. This kva. rate should at present be tried out on the larger customers, because consideration of the remedies for low power factor will show, I believe, that only the larger customers are in a position to install synchronous equipment. In other words, the remedy at minimum cost per kva. to the customer in investment lies in the hands of the larger customer.

Some exponents of a kva. rate believe that it should cover all power customers. They agree that the cost of distribution and the cost of station equipment are directly dependent upon kva., not kilowatts. It is, therefore, a matter of justice to customers to sell on a kva. rate to all. This may be true, but it must not be overlooked that rates are based on average conditions and cannot be 100 per cent correct.

In making a rate such as the three-part or Doherty rate certain assumptions are made in order to determine the demand charge. First, the customers are assumed to be average customers working eight hours a day. A diversity factor and power factor are next assumed, in order to get the station load caused by these customers. Then, after a consideration of costs chargeable to demand, a tentative schedule is made. The kilowatt-hour charge is easily figured from generation costs. After this is done any company contemplating supplanting its rates by a new rate will next figure a number of bills on the new and old schedules to see how company revenue will be affected by the new schedule. Attention is also given to the question of whether or not the new schedule is correct commercially; that is, whether electricity will be purchased by customers in competition with other sources of power.

The three-part rate is the best type of rate at present known, yet it is not 100 per cent correct and in a few exceptional cases is not strictly ethical; that is, the customer under exceptional conditions pays more or less than he should. It is the writer's opinion that errors due to deviation from the other average conditions assumed in building a rate schedule are much greater than the error due to deviation from the assumed power factor; consequently there does not seem to be any reason at the present time to expect any widespread adoption of a kva. rate for the smaller customers. Neither do existing rates in general appear unjust, nor is a universal kva. rate for all customers the last word in rates. Such a rate applied to small customers would only mean a new allocation of cost without any appreciable effect on power factor, but it does seem advisable that a kva. rate should be offered to large customers where some appreciable improvement may be obtained.

A Harbinger of the Fall Lighting Activity



THE quickening pace of lighting sales with the advent of fall is accompanied by revived interest in kitchen units in many localities. The effective billboard used at Worcester, Mass., in this work carries a terse but significant message that appeals to the local public.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Diesel-Engine Standby Plant.—The Peninsula Power Company of Madison, Wis., has recently installed a Diesel engine standby plant at Iron River, Mich., to supplement water power in preference to extending the existing steam plant. The plant consists of two Diesel engines, with a total rating of 2,150 kva. The cost was $187.74 per kilowatt, and the average economy 0.676 lb. of oil per kilowatt-hour. A generel description of the plant is given, with an itemized table showing its cost.—*Power*, Sept. 9, 1924.

Possibilities of Lignite Distillate as an Internal-Combustion Engine Fuel.—C. E. KERCHNER.—The author presents data on tests made with a small Hvid engine operating on a lignite oil as compared with gas oil and kerosene. Lignite oil, when suitably distilled, is shown to be an efficient and promising fuel for the internal-combustion engine. Since the by-products of lignite are valuable, its oil may become of commercial importance when scarcity of petroleum products is felt, and even sooner in those regions where vast deposits of this material are found, such as in North Dakota, South Dakota and Montana. — *Mechanical Engineering*, September, 1924.

Generation, Control, Switching and Protection

Horn-Gap Arrester.—F. KESSELRING.—Owing to its simplicity the horn gap is still the most frequently used arrester for high-voltage lines. In general, practical experiences with this type of overvoltage protector have been very satisfactory, with the following exceptions: For small currents there is a tendency of the arc to stick within the narrowest part of the gap. For very large currents, on the other hand, the safe interruption is frequently difficult. Attempts had been made to overcome both by placing the arc within a narrow chimney or in a strong magnetic blow field, but with no signal results. The recently developed Bendmann arrester, however, has, it is claimed, has solved this problem. A small resistance is placed in the grounding path and across it is shunted a magnet with a movable armature. When the gap flashes over the voltage drop across the resistance energizes the magnet, the armature of which is attracted, and with it the gap is short-circuited. Magnet and short-circuiting switch are placed under oil. As soon as the gap is thus short-circuited the magnet loses its excitation and the auxiliary switch opens again, preventing the machine current from following with the overvoltage. Oscillograms are given to illustrate the operation of this arrester. The author develops mathematically and graphically the theory and performance of this new protective apparatus. — *Elektrotechnische Zeitschrift*, July 31, 1924.

Analysis of Oil-Circuit-Breaker Requirements for Large Steel Plants.—M. J. Wohlgemuth.—The conditions which the protective device must fulfill are stated. A method is shown for estimating the power to be handled on short circuit at a given point, based on the percentage of impedances from the source. The numerical solution is worked out for a typical case where a number of loops feed a particular substation bus.—*Electric Journal*, September, 1924.

Semi-Diesel Operation at All Load Ratings.—H. F. SHEPHERD. — Certain types of semi-Diesel engines possess variable operating characteristics through the load range. If steady at light loads, they might be prone to overheat at rating, or if possessed of a good overload capacity and ready heat dissipation at rating, they might be unstable in operation at moderate loads, unless compensating devices were utilized. Several influences enter into the difficulty, the most important of which is scavenging. Methods of correcting this are: (a) increasing the scavenging efficiency as the load increases, (b) using a constant low-scavenging efficiency to insure light-load operation and using water injection to cool the charge at heavier loads, and (c) using a constant high efficiency of scavenging with a compensating device.—*Power*, Sept. 2, 1924.

Transmission, Substations and Distribution

High-Capacity Oil Switch.—M. VOGELSANG.—The present demand for high-capacity oil switches which will open heavy short circuits with a large factor of safety caused a German firm to develop such a breaker. Its constructive details show marked advances over existing types. The features of this "switching machine," as the author calls the new breaker, is a very long contact stroke and an extremely high contact speed. The former pulls the arc a safe distance down into the oil, the latter is more than twice as high as was formerly customary. A powerful and ingenious spring mechanism accomplishes an opening speed of 1½ m. per second. For remote control of these switches, which require a considerable mechanical effort to close them, either heavy direct-current solenoids or a spring motor may be used, the latter being put under tension by a small three-phase motor. With the exception of the size of the contacts the three sizes of breakers for 350 amp., 600 amp. and 1,000 amp. do not differ in size, because they are designed primarily for short-circuit capacity. A direct-acting electromagnetic relay of novel design, installed under the cover of the breaker, releases a train of gears, which in turn unlatches the opening mechanism. About 900 amp. is required to trip the switch.—*Elektrotechnische Zeitschrift*, July 24, 1924.

Method of Wooden-Pole Impregnation.—R. NOWOTNY.—Instead of impregnating wooden poles by submerging them in certain liquids under a partial vacuum, the recently developed Cobra process provides on each pole only an impregnated zone, about 4 ft. long, so placed that 2½ ft. of it remains above the ground when the pole is set. The impregnating solution is chiefly a mixture of fluor-natrim and dinitrophenol natrim, to which may be added some arsenic if there is danger from insect attacks. These materials form a paste, which is introduced into the pole by injection with a hollow needle. From 180 to 200 such injections are made into the impregnated zone of each pole, introducing from 3 cu. m. to 5 cu. cm. in each one, or a total of 1 kg. of the paste per pole. The depth of these injections may vary between 4 cm. and 8 cm. The cost of this impregnation is about one-half of the cost of customary methods. More than 100,000 poles have so far been treated by the Cobra method, but the recent introduction of the method permits no practical data on the life of such poles.—*Elektrotechnik und Maschinenbau*, Aug. 24, 1924.

Units, Measurements and Instruments

Corrosion Testing by Different Immersion Methods.—HENRY S. RAWDON and A. I. KRYNITSKY.—The need for choosing a corrosion test which shall in some measure approximate the service conditions is emphasized and illustrated by reference to an unusual case of corrosion in a submarine cable. The general types of immersion tests, simple or total immersion and two kinds of repeated immersion, continuous and intermittent, are described and illustrated as to the apparatus used. Test results for a series of chromium steels in immersion tests of the simple and repeated type in distilled water, as well as immersion in dilute hydrochloric acid and citric acid, are given. In general, the chromium steels are more resistant to the intermittent immersion than to simple immersion in distilled water—a phenomenon which appears to be associated with the formation of a protective film over the surface of the specimen.—*Paper presented before the American Electrochemical Society, Detroit*, Oct. 2-4, 1924.

Illumination

Columbus Street-Lighting Demonstration.—F. C. CALDWELL.—The most extensive exhibition of various types of street lighting ever made is now to be seen on the streets of Columbus, Ohio. About two years ago the urgent need for improved lighting on certain streets led to a demand that the present system of cluster lighting be extended. As this system was obviously out of date, a request was made that the Chamber of Commerce appoint a committee to advise the city what should be done to obtain the most approved lighting, not only for the streets in question, but as

rapidly as financial conditions would allow, for the whole city. This committee installed a demonstration showing street-lighting equipment of four manufacturers and is engaged in making a comparative study of these exhibits.—*Transactions of the I. E. S.*, September, 1924.

Photo-Electric Photometer and Densitometer.—E. A. BAKER.—A short period electrometer is described which has an exceptionally long scale and gives readings proportional to the ratio of two potentials. It is applied in the construction of a photo-electric photometer and a photo-electric densitometer, both instruments being independent of battery variations.—*Journal of Scientific Instruments (England)* August, 1924.

Motors and Control

Economy of Electric Threshing.—H. HOLM.—A detailed cost comparison is given for the threshing on a wheat farm of 1,200 acres, considering crude-oil motor drive (40 hp.), steam locomobile (30 hp.) and electric motor (30 hp.). The salient cost figures are as follows (all costs in gold marks):

	Crude Oil (Oil 15 marks per 100 kg.)	Steam (Coal 33 marks per ton)	Electric (Energy 0.25 mark per kw.-hr.)
Investment.....	12,000	9,000	4,400
Interest, amortization and upkeep	2,580	1,440	467
Operation.....	3,330	2,500	1,827

In spite of its high efficiency as a stationary motor for permanent drive, the crude-oil motor is not recommended as a portable threshing motor, because it requires very careful attention, a large amount of cooling water and has little overload capacity.—*Elektrische Betrieb*, Aug. 24, 1924.

Comparison of Pumping Equipment.—R. T. LIVINGSTON.—In selecting pumping equipment two problems must be considered—first, that of choosing between a number of proposed types of pumping equipment and, second, that of selecting the best unit of the type chosen. The author points out that for certain types of service certain types of equipment would be the most suitable for various structural or other reasons.—*Power Plant Engineering*, Aug. 15, 1924.

Theory and Calculation of the Squirrel-Cage Repulsion Motor.—H. R. WEST.—The author presents the results of an analytic study of the recently developed squirrel repulsion motor, with particular reference to its operation. The derivation of the method of calculation is outlined and some of the more interesting results are given.—*Journal of A. I. E. E.*, September, 1924.

Problems of Steel-Mill Operation.—A. J. WHITCOMB.—Some trends and recent developments in problems of steel-mill operation, involving the use of electrical and mechanical power-drive equipment, together with tendencies in power generation, distribution and application, are given. Following are the outstanding tendencies and developments: Replacement of obsolete steam-engine drive with complete electrical operation, centralization of and use of larger units for power generation, installation of automatic substations, the use of electric precipitation of dust in blast-furnace gas and the increased interest in the use of ball and roller bearings on mill-type and general-purpose motors. These developments, toegther with other general trends are discussed.—*Industrial Engineer*, September, 1924.

Heat Applications and Material Handling

Application of Static Condensers to High-Frequency Furnaces.—R. E. MARBURY.—The power factor of an induction furnace is very low. If energized from a high-frequency generator, the cost of the latter can be much reduced if it is required to supply only the energy component, leaving the reactive component to be supplied by a condenser, of which the cost is limited by the stored energy to be handled per unit volume of insulating material. A condenser assembly for 1,600 kva., 5,000 cycles, 4,000 volts, is shown.—*Electric Journal*, September, 1924.

Electric Smelting of Iron Ore in Norway.—G. TYSLAND.—This paper is a continuation of an earlier paper by Mr. Batt, previously mentioned (*Teknisk Ukeblad*, Feb. 15, 1924). The inception of this industry in Norway took place in 1910, when a number of ovens of the type previously used in Sweden were installed at the Hardanger Ironworks. The Swedish system was developed for the use of charcoal as reduction material. Charcoal is not available in sufficient quantities in Norway, however, so that a new type of oven was developed in which the charcoal is replaced by coke. The first successful installation of this kind was made at the Tinfos Ironworks, and this has been in operation for some time. The Tinfos oven possessed certain disadvantages, however, which prevented its general application. Another electric coke oven, patented by C. W. Soderberg of the Norwegian Electrochemical Industries, Ltd., was subsequently developed at the Fiskaa Ironworks in Kristiansand. The fundamental feature of this oven is the use of "continuous electrodes," around which the charge is placed to a considerable depth, in distinction from the earlier types, where the electrodes were placed either at the top or the bottom of the charge. The main part of the present paper contains a description of this development and a detailed report of the results that have been obtained.—*Teknisk Ukeblad (Norway)*, Aug. 23 and 30, 1924.

Electrophysics, Electrochemistry and Batteries

Introduction of Carbonaceous Matter in Electro-Deposited Iron and Nickel.—P. K. FRÖLICH.—It has been definitely shown that carbonaceous matter may be found in electrodeposited iron and nickel when there is not the slightest indication of any organic colloid in the electrolyte from which deposition takes place. Salts of organic acids or carbonaceous gases dissolved in the electrolyte are in many cases sufficient to account for the contamination of the deposited metal with carbonaceous matter. It is even possible to introduce such impurities into absolutely pure electrodeposits of iron and nickel by exposing these deposits to cathodic polarization in solutions containing nothing but organic salts or carbonaceous gases plus a conductivity salt. The reactions responsible for the contamination are more or less dependent upon the nature of the inorganic ions discharged at the electrodes.—*Paper presented before the American Electrochemical Society, Detroit*, Oct. 2-4, 1924.

Traction

Radio Disturbances Due to Street Railway.—F. EPPEN.—At radio receiving stations near a street railway line very pronounced interferences were noticed, which were traced to high-frequency waves caused by sparks between the trolley contact wheel and the trolley wire. But it was found that sparks caused by heavy motor current were harmless in that respect. It was the small current, supplying the lights in the cars at night, which caused the trouble. Careful tests, made in cooperation by the broadcasting stations and the Berlin street railways, established definitely that the interferences stopped when the car took more than 1 amp. from the trolley wire. It was also found that all humming in the telephones ceased absolutely during rainy weather. Condensers across the car installation had no effect. A shunt was found the best remedy, passing about 2.5 amp. to bridge the lamps when the controller handle is in the "off" position. The suggestion is made that this otherwise wasted energy of 1,375 watts can be utilized for illuminating car advertisements.—*Elektrotechnische Zeitschrift*, July 31, 1924.

Telegraphy, Telephony, Radio and Signals

Radio Direction-Finding Observations.—R. L. SMITH-ROSE.—An account is given of some experiments conducted with two direction-finding receiving stations taking observations on ship transmitters at various positions in the North Sea between England and the Continent. Damped waves of 450-m. length were employed. The results obtained are analyzed in detail and the various errors encountered are described. The general conclusion drawn from the experiments is that when the path of transmission is entirely oversea and in a direction making an appreciable angle with the coast line, so as to be free from coastal refraction effects, the accuracy of radio direction finding is sufficient for many navigation purposes up to ranges approaching 100 miles.—*Journal of the Institution of Electrical Engineers (England)*, August, 1924.

Elimination of Radio Disturbances Caused by Cottrell Precipitators.—R. E. BOEHLER.—High-frequency radiation set up by a Cottrell precipitator and the Lempke rectifier causes a disturbance in radio receiving sets within a range of 15 miles. It covers a broad wave band in the range between 100 m. and 500 m. By installing suitable inductance coils in the line the wave length was increased to 1,500 m. and the radiation greatly weakened.—*Electric Journal*, September, 1924.

New Books

Electrical Machinery and Control Diagrams

By Terrell Croft. New York: McGraw-Hill Book Company, Inc. 300 pages, illustrated.

A well-printed book containing 500 connection diagrams for all apparatus usually encountered in practice. Each diagram is self-contained, well drawn and briefly explained. The book should be very useful to all men engaged in motor, generator and switchboard control and operation and should be a useful reference text in the colleges.

Control of the Speed and Power Factor of Induction Motors

By Miles Walker. New York: D. Van Nostrand Company. 145 pages, illustrated.

In his usual thorough and delightful manner Dr. Walker has presented in this attractively printed book the latest advances in the design and operating performance of induction motors. He derives the circle diagram by the method of inversion and applies it very widely to all types of motor designs and to cases where the power factor of the rotor load is not unity. The locus diagram with variable reaction in the rotor circuit is worked out.

All the methods of speed control are classified, explained and presented in their theoretical aspects. Special arrangements such as cascade motors are treated in detail. Then the subject of speed and power-factor control is considered and the usual types of motors are presented and explained. A good chapter on the phase advancer clearly explains the possibilities of this rather unusual development. The book is certain to find a ready welcome in the libraries of motor specialists and in those of the colleges.

Elements of Electrical Engineering

By George D. Shepardson. New York: Macmillan Company. 326 pages, illustrated.

An introductory book for students in technical schools and colleges must face a fire of criticism because of the large number of such texts now available. Professor Shepardson has done a very good job and has incorporated several features that cause his treatise to differ from similar works. Fundamental principles are used, yet there is a practical thread running through the book sufficient to hold the interest of students. The book is splendidly illustrated and has a good list of problems and in addition references in each chapter to information available in other books and periodicals. Its completeness is evidenced by the inclusion in an appendix of directions for laboratory experiments.

The usual fundamental electric, magnetic and dielectric circuits are treated and illustrated by brief descriptions of their application to commercial machines. A student will possess a complete electrical vocabulary after studying the book and should have fundamental conceptions of the principles involved in modern electrical engineering. Electrometallurgy and electrochemistry are touched upon and chapters are devoted to insulation, conductor materials, wires and resistance measurements. The fundamentals of alternating-current circuits are considered briefly, and a chapter is accorded to transmission and distribution. In appendices are found many valuable tables, a bibliography, a list of symbols and an outline of electrical chronology. The book is well edited and printed and should find a ready use in many schools.

In criticism it may be said that, like many other works of its class, the treatise covers too many topics in too sketchy a manner and presents them to the student in a series of fully outlined paragraphs ready for memorizing and digestion. Many teachers disagree with the almost universal "pink-pill" method of writing textbooks and advocate a reversion to a style that calls for a greater degree of analytical reasoning on the part of the student.

L. W. W. M.

Jahrbuch der Elektrotechnik

Vol. XI, 1922. Edited by Dr. Karl Strecker. Munich and Berlin: R. Oldenbourg. 241 pages.

This "survey of the more important events in the general domain of electrotechnics" is a comprehensive yet discriminating and extraordinarily compact compilation by a large staff of engineers and scientists of the year's activities as recorded in periodical literature. Non-German references include numerous citations from English and American publications, of which more than forty are listed. The entries in the authors' and topical indexes exceed four thousand. The technical library that gets a copy is likely to fall into a habit of subscribing for future issues.

G. F. W.

Michael Faraday

By Wilfrid L. Randell. London: Leonard Parsons. Boston: Small, Maynard & Company. 192 pages, portrait. Price, 4s. 6d.

This short biography of Faraday is not designed to replace on the shelves of scientists and engineers the standard two-volume life by Bence Jones or the shorter works by John Tyndall, J. H. Gladstone and J. A. Crowther. It deals with Faraday the man rather than Faraday the scientist and is for the general reader, to whom a mere outline of the achievements on which rest the great experimenter's title to fame is sufficient, but who is interested in his character and personality. The author has not had the skill to dramatize as vividly as might have been done even in a brief sketch the rise—so extraordinary in the undemocratic England of the nineteenth century, where men made shoes or laws because their fathers did—of the son of a blacksmith from errand boy and bookbinder's apprentice to fellow of the Royal Society at thirty-three and ranking scientist of the Anglo-Saxon world at forty. The book is written in the expository and rather smug style of most "popular" biographies, but it traces the chief events in Faraday's life interestingly enough, estimates his genius fairly and pays tribute with the proper degree of discrimination to his high, unusual and attractive character.

Book Notes

Principles and Practice of Electrical Engineering. By Alexander Gray; revised by R. F. Chamberlain. Third edition. 445 pages, illustrated.

One of the most popular textbooks now used has been thoroughly revised by Professor Chamberlain. The text has been brought up to date and new problems have been added.

Linear Integral Equations. By W. V. Lovitt. New York: McGraw-Hill Book Company, Inc. 250 pages, illustrated.

This valuable little work deals with the particular functional equation called the integral equation. The general theory is explained and applications are made to differential equations, calculus of variation and noted problems in mathematical physics, including Neumann's problem and Dirichlet's problem. The work should be very useful to students in advanced mathematics and in highly specialized branches of engineering and physics.

Handbook of Direct Currents. By K. C. Graham. Railwaymen's Handbook Series. New York: Simmons-Boardman Publishing Company. 164 pages, illustrated.

An elementary and practical book on direct-current circuits and machines. Principles are accented and illustrated by many diagrammatic sketches.

The Engineering Index—1923. New York: The American Society of Mechanical Engineers. 700 pages.

The new edition of the engineering index conforms to the precedents of the past and yet is improved very greatly in its make-up and covers its field more extensively. The alphabetical arrangement of topics and the essential cross-indexing make this compendium of literature on engineering subjects an invaluable asset to engineering libraries and to engineers who are interested in seeking the latest information on work with which they are connected. By means of this very complete reference bibliography and the concise topical index under each article much laborious library research can be obviated and much valuable information can be obtained quite readily.

Crain's Market Data Book and Directory of Class, Trade and Technical Publications. By G. D. Crain, Jr. Fourth edition. Chicago. 505 pages. $5.

A number of changes and improvements, based upon the widening demands of subscribers, have been incorporated in this edition. Detailed advertising rates are given, while in addition to figures showing total circulation the distribution of circulation by classes of readers is also shown. The market data for each section have been revised and in most cases completely rewritten, with new figures and other statistical and marketing facts.

Books Received

Strowger System of Automatic Telephony. By H. H. Harrison. London: Longmans, Green & Company. 146 pages, illustrated. $2.50.

Electrical Measurements in Theory and Application. By Arthur Whitmore Smith. New York: McGraw-Hill Book Company, Inc. 338 pages, illustrated. $3.

Automatic Telephone Systems. Vol 3. By William Aitken. New York: D. Van Nostrand Company. 339 pages, illustrated. $12.50.

Applied Electricity for Electrical Men. By Arthur J. Rowland. New York: McGraw-Hill Book Company, Inc. 443 pages, illustrated. Price, $2.50.

News of the Industry

Power from Skagit Becomes a Fact

Seattle's Municipal Hydro-Electric Project Went Into Use on September 27—Initial Installation of 56,000 Hp. Can Be Expanded to 225,000 Hp.

AFTER repeated delays, Seattle's eleven-million-dollar municipal hydro-electric plant on Lake Skagit was formally put into use on Saturday, September 27, when President Coolidge pressed a golden key at Washington which sent a spark over the Postal Telegraph Company's wires in relay across the continent and set the machinery in motion to transmit energy over a hundred miles of wire to the city's distribution system. The initial installation consists of two 11,000-volt, three-phase, 60-cycle, 30,000-kva. generators connected to 37,500-hp. vertical turbines, designed for a normal head of 375 ft. and operating until the completion of the masonry dam at Gorge Creek under a 270-ft. head. The actual rated capacity of the reduced head is 56,000 hp. at the generators. Connection is made from the main tunnel to each turbine by a steel penstock 10 ft. in diameter, controlled at the lower end by a balanced valve. The present installation can be expanded to generate 112,500 hp. and eventually 225,000 hp., and the entire project as conceived contemplates an ultimate year-round production from Lake Skagit of 550,000 hp. In order to carry out this great scheme the men behind it contemplate construction of a masonry dam on the Skagit just below the mouth of Ruby Creek, about 11 miles above the present Gorge Dam site. The proposed dam would be 480 ft. high, with a depth to bedrock below water of 30 ft. A reservoir 23 miles long containing 1,300,000 acre-feet of water would be created by the dam. It is proposed then to build a power house 3¼ miles farther down the river near the mouth of Stetattle Creek, this plant to be equipped with six generating units. Leading from the Ruby Dam down to the power house would be a tunnel 3 miles long and 28 ft. in diameter.

Power Shortage Less Acute

Situation in Southern California Is Somewhat Relieved by Co-operative Plans

THROUGH the co-operation of the consumers of electricity served by the Southern California Edison Company, that company was able as early as September 8 to modify the restrictions on the use of electrical energy, but ten days later it was again found necessary to restrict the use of industrial power consumers 10 per cent. Full use of residential and commercial lighting is now permitted. New business in lighting is being taken on under the usual regulations and power business up to 3 hp. is being taken on without restrictions.

In addition to benefiting by the decreased consumption of electrical energy on the part of the consuming public, the company has been able to conserve water, which, coupled with the fact that steam units have been brought in thirty days sooner than anticipated, has very much relieved the acute situation that has existed since last spring on account of the abnormal drought in the Pacific Coast States.

The first unit in the Long Beach steam plant of the Southern California Edison Company will be in operation by December 1, after which the power situation will be entirely normal. With the completion next spring, eighteen months ahead of the original schedule, of the 13-mile Florence Lake tunnel on the company's Big Creek project, it will be possible to fill Huntington Lake, one of the main storage reservoirs, even with no more precipitation than in the past season. When the Long Beach and Big Creek additions are in service the Edison company will have generating facilities for 700,000 hp., an increase of 36 per cent over the early part of 1923, thus greatly lessening the chances of a recurrence of this year's experience.

Italy Discarding Government Ownership

Telephone Systems and Branch Railroad Lines Turned Back to Private Hands — Government Now Offering Inducements to Companies to Develop Water Power

LUIGI LUIGGI

THE extent to which Italy has already gone in divesting itself of its government-owned utilities was explained by Dr. Luigi Luiggi of Rome tc a representative of the ELECTRICAL WORLD before he sailed for Europe on Wednesday. Dr. Luiggi is a life member of the Italian Senate and professor of hydraulics and hydro-electric engineering at the University of Rome, as well as president of the Italian Society of Civil Engineers. As a director of the Italian State Railways and of the irrigation and inland navigation committees for many years, he is naturally conversant with public utility work in Italy.

Asked as to the policy of the present Italian government on utilities, Dr. Luiggi said that Italy will not engage in any work that can be done by a private company. Its experience with all sorts of governmentally owned enterprises has been rather disastrous, and the government has again turned to private companies to carry on its public utility work. Italy's telephone system, he said, has been split up into zones and turned over to private companies for operation. The new submarine cable from Italy to the United States by way of the Azores was financed by Italian and American capital on the guarantee that the Italian government would use it for transmitting a definite minimum number of words. Branch line railroads have already been turned back to private operation, with the probability that the main lines will follow.

NINE-TENTHS OF ELECTRIC UTILITIES PRIVATELY OWNED

With the exception of approximately 10 per cent, all of the electric public utilities are owned by private interests and render service at lower rates than obtain in any other part of Europe. Italy possesses no coal, a l in order to encourage hydro-electric development, the government, according to Dr. Luiggi, offers to pay 40 lire per horsepower per annum for a period of fifteen years to any one who will engage in developing the nation's water powers. As a result plans for developing 1,000,000 hp. have been made, and one-third of that amount of power is now under construction.

As typical of the inefficiency of municipal ownership, Dr. Luiggi cited the case of the city of Rome. Notwithstanding that a private company was engaged in supplying electricity, the Eternal City under a socialistic régime built a competitive hydro-electric system. Owing to unfortunate engineering advice it soon found itself in diffi-

culties. The municipal system had made contracts for more hydro-electric energy than it possessed, so that at periods of low water it was confronted with a serious shortage. What power it lacked it bought from the private company, selling it at higher rates. To make matters worse, the municipal system is so loaded up with employees that it cannot meet its running expenses. The taxpayers of the city, therefore, have to make up the deficit. A while ago the municipal system came to an understanding with the private company to increase all rates throughout Rome with the hope of making up deficits, but the private company is able to offer industrial users a much better service at considerably lower rates. On ten-year contracts the rate is 50 per cent lower than the municipal rate.

VOLCANIC STATIONS UNECONOMICAL

As to the spread of volcanic steam stations, Dr. Luiggi said that such stations were put down at his direction during the war because coal at that time cost 800 lire a ton. However, with coal at 200 lire a ton stations operating with steam obtained from volcanoes are no longer economical.

Dr. Luiggi said that there was a ready market for electricity in Italy, not only in the industrial centers, but in the agricultural districts, where electricity can be used for draining the marshes and also for irrigation work. German capital, he said, was flowing very freely at present into Italy, and the Germans are again obtaining control of the electrical manufacturing plants. Italy, he said, welcomes American capital, but, unfortunately, American trade with Italy is falling off. Since prohibition became effective Italian wines are not coming to the United States, and macaroni, spaghetti, olive oil and other Italian products are now being manufactured in the United States itself.

Dr. Luiggi received the degree of doctor of engineering at the Rensselaer Polytechnic Institute at Troy, N. Y., where he represented the Italian government at the institute's centenary.

Hoover Outlines Achievements and Problems of Radio

The third national radio conference held under the auspices of the Department of Commerce opened in Washington on Monday, October 6. Secretary Hoover outlined the achievements of the radio industry and the problems that confront it and told what it was hoped the conference could do.

At Tuesday's session David Sarnoff, vice-president and general manager of the Radio Corporation of America, explained the project of "superpower" broadcasting stations favored by the corporation and the manufacturing companies and said that it was proposed to establish the first of these near New York City as the experimental forerunner of a nation-wide major system. This proposal was attacked in the meeting by delegates who spoke in the interest of the smaller operators, but Mr. Sarnoff thought their fears ungrounded.

Sir William Price Killed

Partner of J. B. Duke in Quebec Hydro-Electric Development Loses Life in Landslide

SIR WILLIAM PRICE, president of the firm of Price Brothers & Company, the lumber and paper manufacturing company whose great mills are among the leading industries in Quebec Province, and who two years ago formed a partnership with James B. Duke, president of the Southern Power Company, to carry on in that province a great hydro-electric and paper-mill project under the name of the Quebec Development Company, lost his life on Thursday, October 2, in a tragically sudden manner.

Sir William had gone with his chief engineer, A. A. MacDiarmid, who is a member of the American Institute of Electrical Engineers, and another member of his engineering force, H. Monro, to see the place where a small landslide had occurred at Kenogami the day before. Kenogami, the site of the Price Brothers mills, is about 120 miles from Quebec City. According to the somewhat meager details of the accident so far published, Sir William and the two engineers were carried away by a volume of water which swept into a gully near the mills. The engineers succeeded in extricating themselves, but the proprietor, who was some distance from them, was caught by a landslide which precipitated him sixty feet and covered him with earth and timber. This landslide was followed by two others, and no possible hope of rescuing the victim alive was left. The landslides have been attributed both to torrential rains which have lately fallen in that region and to an earthquake.

The site of the Duke-Price hydro-electric development, as readers of the ELECTRICAL WORLD will remember, is at the Grand Discharge from Lake St. John at the head of the Saguenay River. Lake St. John is 25 miles from Kenogami. Here it is prophesied that there will be ultimately a development of approximately 1,000,000 hp. An initial installation of about 225,000 hp. is under way. (See ELECTRICAL WORLD, July 12, page 85.)

William Price was born in Chile in 1867 and educated in England. He entered the firm of Price Brothers & Company in 1886 and became sole partner in 1899. He was interested in other commercial enterprises, was chairman of the Quebec Harbor Commission in 1912 and had been a member of the Canadian House of Commons. In the war he recruited a regiment and became colonel. Was knighted in 1915.

Public Enlightenment Paramount

Empire State Gas and Electric Association Convention Concentrates on Ways and Means to Combat Political Attacks on Public Utilities

ATTENDED by more than three hundred executives of New York utility companies, the twentieth annual convention of the Empire State Gas and Electric Association, held at the Lake Placid Club, in the Adirondacks, on October 6 and 7, was characterized by frank discussions of practical ways and means of inspiring public confidence in the utilities and the men who manage and operate them. In his presidential address S. J. Magee sounded an optimistic note on the progress of better public relations by calling attention to the continually increasing demand for service and the public's willing investment in utility securities. These he interpreted as most significant indications of true appreciation in the public mind of the value and necessity of the service rendered by the industry. He urged that companies capitalize upon the advantage thus gained by redoubling their efforts toward further education of the people in the territories served.

M. S. Sloan, as chairman of the New York State Committee on Public Utility Information, felt that the majority of people do not fear or mistrust the utilities, but that the real menace to the industry lies in the minority, to which he applied President Roosevelt's term, the "lunatic fringe," made up of misguided radicals incited by the political self-seeker. To combat this element a continuous program of publicity must be pursued. Reviewing the past year's work of his committee, Mr. Sloan asserted that the amount of this type of advertising done by the utilities of New York had been more than doubled, placing them abreast of those in any other state and ahead of many.

TRAINING EMPLOYEES

In an address on "Training of Employees for Public Utility Service," Arthur Williams, New York Edison Company, asserted that central-station companies have long rendered an almost perfect technical service side by side with an inadequate and imperfect personal service. Only through competent training of company personnel can the human element be brought up to a standard comparable with that of the technical functions.

C. F. Lacombe urged that the first step in this direction be an honest effort on the part of the executives to impart to their employees an absolute faith in the integrity of purpose of their companies. W. J. Welsh asked how it would be possible to raise the element of personal service to a plane comparable with technical service so long as the salaries paid by utilities were not comparable with those of organized labor.

The importance of women in the successful operation of public utilities occupied a prominent place on the program of the meeting. Mary E. Dillon, chairman of the woman's section of the Committee on Public Utility Information, recommended the employment of women not only in a clerical capacity but also for positions calling for tact

and courtesy in contact with customers.

Addressing the convention on the "Social Significance of Gas and Electric Service," Mrs. Rosalie Loew Whitney gave to the utility companies a large part of the credit for the emancipation of women from household drudgery. She suggested that public utility information sources make an especial effort to place before women's clubs and federations the economic facts concerning government ownership, hydro-electric development, superpower and public utility regulation.

Roland B. Woodward, secretary of the Rochester Chamber of Commerce, in discussing the question of "Public Utilities and Public Welfare," pointed out that in their publicity campaigns the utilities are confronted by a general public which he styled a "nation of economic illiterates." This public must be taught the principles of private ownership and that the solution of the problem of public service is economic, not political.

Harry D. Robbins, chairman of the national vigilance committee, Associated Advertising Clubs of the World, spoke on "Truth in Advertising," particularly as it affects the public utility business.

Officers elected for the ensuing year are: President, M. S. Sloan; first vice-president, E. C. Scobell; second vice-president, H. M. Brundage; treasurer, W. J. Welsh.

Electrochemists Discuss Electric Furnaces

Detroit Meeting Also Considers Industrial Electric Heating and Listens to Address by Alex Dow on "Central-Station Design and Superpower"

ADVANTAGES of electric cast-iron furnace operation received great attention at a "round-table" discussion held at the Hotel Tuller, Detroit, in connection with the convention of the American Electrochemical Society, on October 2. There also was an interesting symposium on industrial electric heating on October 3. The electric cast-iron discussion was started before more than 150 engineers by Dr. Richard Moldenke, consulting metallurgist, Watchung, N. J., who outlined three advantages of electric operation. Assuming that a tonnage basis is desired, these advantages are that a higher heat is available than is possible with cupolas, that this high heat affords a deoxidizing atmosphere and that thus there is a medium of obtaining low sulphur content. Using basic lining furnaces as an example, Dr. Moldenke pointed out that, with all the scrap and borings now used, the electric furnace makes it possible to produce cast iron of a good quality continuously. Where a high grade of cast iron is absolutely necessary, as for the production of piston rings, there is a great field for the electric furnace despite operating cost.

Encouraging experience with electric heat treating and annealing was reported at the meeting on Friday. R. H. MacGillivray, Stewart-Hartshorne Company, East Newark, N. J., told of experience with electric furnaces in the continuous hardening and tempering of wire.

F. S. Heath brought out the fact that the economic limit in increasing the speed of brass meltings depends entirely on the life of the linings. With a furnace operating at only 70 kw., having a life of 2,000 heats, the lining life was lowered to 1,000 heats when operated at 90 kw. to 100 kw.

H. M. St. John, Detroit Lubricator Company, declared that the rapid melting of brass was determined by only one feature—a proper heat mixture. Unless the heat could be applied uniformly, certain sections would be overheated and others would not receive enough heat to produce a homogeneous metal.

Dr. A. E. White, director of engineering research, University of Michigan, gave an excellent review of the use of electric furnaces in heat treatment. Data were presented on two electrically carburizing furnaces which showed a net load efficiency when handling 3,270,125 lb. of 17.4 per cent. This compares most favorably with oil-fired carburizing furnaces having a net efficiency of only 2½ per cent. Dr. White urged that accurate economic data on electric furnace operation be compiled by the industry.

Dr. C. F. Hirshfeld declared that danger from explosion in electric japanning ovens can be reduced by proper control of the air mixture, a clean oven and operation at low temperatures. Wirt S. Scott, Westinghouse Electric & Manufacturing Company, asserted that most explosions are due to a lack of proper ventilation. His experience has shown that with 95 per cent air and a 5 per cent solvent no explosions will occur.

Alex Dow, president Detroit Edison Company, gave an address on "Central-Station Design and Superpower" at the Friday evening meeting. He alluded to the changes in power-plant design since his address before the society in 1917. Where heat-balance control for feed-water heating was common practice in 1917, turbine bleeding now is common practice since it does not require the installation of expensive economizers. He also told some of the reasons why powdered fuel is used in the Trenton Channel power house. With investment costs per kilowatt of installed capacity in 1917 averaging $60, as against an average of $100 per kilowatt in 1924, Mr. Dow said that the increased expense to obtain higher thermal efficiency must be offset by the limits to which high investment charges can climb.

Other events of the convention were symposiums on corrosion and electric furnace refractories and a "round-table" discussion on control methods in electrodeposition. Many papers were presented. It was decided to hold the spring meeting at Niagara Falls, when a special symposium on fused electrolysis will be a feature of the program.

Electragists Talk Margins

John F. Gilchrist Addresses West Baden Convention—President Strong Will Soon Retire from Office

RETAIL margins on the sale of electrical appliances are gradually increasing and bringing the electrical dealer a better opportunity to establish himself as a prosperous merchant. This was the consensus of the opinion voiced in a spirited discussion of distribution and merchandising policies in the closing sessions of the convention of the Association of Electragists International, held last week at West Baden Springs, Ind. Consideration of this subject culminated in an address by John F. Gilchrist, vice-president Commonwealth Edison Company, Chicago, in which he described the merchandising experience of his company, which is now selling $4,200,000 of electrical merchandise by "high-pressure" methods. Of this 15 per cent comes back, leaving a net sale of $3,600,000. The average "spread" on this merchandise has gradually worked up from 23 per cent a few years ago to about 33 per cent today. Mr. Gilchrist said he believed that this margin would prove profitable were his company content to sell, say, $1,500,000 by ordinary methods of retailing, but the value of the additional load obtained justified the forcing of larger sales. He estimated that every household today can economically own from $600 to $700 worth of electric labor-saving appliances, which it should be able to absorb at the rate of at least $60 a year—an indication of the tremendous opportunity that lies ahead.

Representatives of credit finance companies testified that the contractor-dealer should have a discount on merchandise of not less than from 40 to 45 per cent, and that manufacturers who give too small margins are not in a safe position because they are not building up prosperous distributors.

William L. Goodwin, vice-president, Society for Electrical Development, pointed out that the electrical dealer need not fear the competition of the hardware and department stores on the score of insufficient margins, since these large merchants themselves have large overhead expenses necessitating wide discounts. What the dealer needs in this comparison is merchandising proficiency and the satisfactory basis of price that can be arranged with manufacturers. Analyze the profit needs of individual lines, Mr. Goodwin advised, and do not demand that popular appliances provide spread enough to compensate for losses on other lines.

Earl E. Whitehorne, commercial editor ELECTRICAL WORLD, reviewed the status of local electrical league development and described the basis on which the national confederation of leagues was effected at the recent conference of leagues on Association Island, N. Y.

The next annual convention of the association will be held at the same place, probably during the week of September 21, 1925, the manufacturers expressing satisfaction with this year's exhibition and a desire for another one next year. James R. Strong retires as president of the association on

January 1, and a mail vote of the membership will be taken to elect his successor. Joseph Fowler of Memphis is prominently mentioned in this connection.

Forty-four More Pledges

National Manufacturers to the Number of 109 Are Now Aiding the Home-Lighting Contest

A TOTAL of 109 national manufacturers have now pledged support financially to the international fund of the Lighting Educational Committee. Forty-four not previously reported are listed below. These include electrical manufacturers of all descriptions, fixture manufacturers, glass manufacturers and lamp manufacturers. They are:

M. & W. Company, Springfield, Mass.
Electric Glass Company, Toledo, Ohio.
General Illuminating Company, Brooklyn, N. Y.
Consolidated Electric Lamp Company, Danvers, Mass.
Kentucky Electric Lamp Company, Owensboro, Ky.
Nilco Lamp Works, Inc., Emporium, Pa.
Economic Lamp Company, Malden, Mass.
Hygrade Lamp Company, Salem, Mass.
Miniature Incandescent Lamp Corporation, Newark, N. J.
Lightolier Company, New York.
Edward F. Caldwell, New York.
H. A. Framburg & Company, Chicago.
Fibreduro, Inc., Brooklyn.
Cassidy Company, Long Island City.
Faries Manufacturing Company, Decatur, Ill.
National Carbon Company, New York.
Arrow Electric Company, New York.
Johns-Manville Company, New York.
Western Electric Company, New York.
Weber Electric Manufacturing Company, New York.
Charles J. Weinstein, New York.
Bayley & Son, New York.
Sterling Bronze Company, New York.
S. B. Condit Electric Manufacturing Company, South Boston, Mass.
Chase Shamut Company, South Boston, Mass.
Rome Wire Company, Rome, N. Y.
A. J. Lindemann & Hoverson Company, Milwaukee, Wis.
Habirshaw Electric Cable Company, Inc., Yonkers, N. Y.
Safety Insulated Wire & Cable Company, New York.
Pittsburgh Transformer Company, Pittsburgh, Penn.
Benjamin Electric Manufacturing Company of Canada, Toronto.
Crouse-Hinds Company, Syracuse, N. Y.
Acorn Insulated Wire Company, Brooklyn, N. Y.
Crescent Insulated Wire & Cable Company, Trenton, N. J.
Diehl Manufacturing Company, Elizabeth, N. J.
Economy Fuse & Manufacturing Company of Canada, Ltd., Montreal, Quebec.
Hart & Hegeman Manufacturing Company, Hartford, Conn.
Harvey Hubbell, Inc., Bridgeport, Conn.
Indiana Rubber & Insulated Wire Company, Jonesboro, Ind.
Johns-Pratt Company, Hartford, Conn.
Robert Mitchell Company, Ltd., Montreal, Quebec.
Ohio Brass Company, Mansfield, Ohio.
Vosburgh Miniature Lamp Works, Orange, N. J.
Wheeler Condenser & Engineering Company, Carteret, N. J.

In three states, Michigan, Maine and Pennsylvania, the state educational authorities have indorsed the movement.

Railway Men Hear of Benefits to Utilities from Advertising

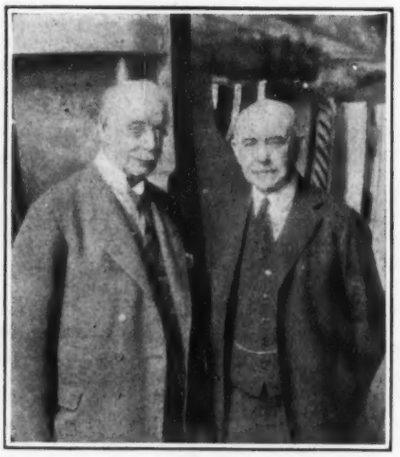
With the usual large attendance and general enthusiasm, the American Electric Railway Association opened its forty-third annual convention at Atlantic City, N. J., on Monday of this week, when W. H. Sawyer of East St. Louis, Ill., spoke on the benefits that accrue to electric railway and other utility companies from proper newspaper advertising.

"Effective publicity has caused electric railway companies to be born anew, as it were," he said, "radically and effectively to change public sentiment by giving the public—our customers—the facts. The public is entitled to know the facts regarding the public utility, just what is done and why it is being done. We cannot expect cooperation except as we give our customers full and complete knowledge of the facts, take them into our confidence and do our part toward instilling into them a just pride in their company. Publicity not backed up by performance is, however, worse than useless."

On Tuesday a message from President Coolidge was read, and President Britton I. Budd of Chicago made his address. Mr. Budd stressed the point that experience and analysis both show that the electric railway must still be depended on for the major part of local transportation, and also that railways keenly alive to this opportunity are having no trouble in financing their needs. Allen G. Hoyt, vice-president National City Company, New York, discussed financial problems. T. N. Carver of Harvard University gave a very able address, analyzing not only the public policy benefits of customer and employee ownership but also the broad economic and social reasons for and results from such policies. This address was fully discussed by C. W. Kellogg, of Stone & Webster, Boston, and Fred Scheel, vice-president Utility Securities Company, Chicago. A paper on Muscle Shoals by Robert G. Gordon of Louisville was on Thursday's program.

Award of the Charles A. Coffin Foundation medal for 1924 was made to the Northern Texas Railway Company, and the medal was presented to G. H. Clifford, vice-president and manager.

Sir Charles A. Parsons Sails



THE famous English engineer and designer of steam turbines, Sir Charles A. Parsons, sailed last Saturday for England after a short visit to America during which he had been the recipient of many honors and attentions. He is shown on the right of E. W. Rice, Jr., honorary chairman of the board, General Electric Company.

New York's Electrical Show to Be Held October 15-25

The annual Electrical Exposition at New York City will be held at the Grand Central Palace October 15 to 25. The space on the first and second floors will be filled by manufacturers' exhibits. The third floor will be given over largely to exhibits by the government arranged by the Army Signal Corps, the Navy Department, the Department of Commerce and the Bureau of Engraving and Printing. Several central-station companies will have exhibits, a larger number than in other years.

Among the features of the exposition will be an "Edison Lamp Day" in commemoration of the forty-fifth anniversary of the invention of the incandescent lamp. This will fall on Tuesday, October 21. There will be a historical display showing the development of electric lamps from Edison's first laboratory products to the high-efficiency lamps now in use. Mr. Edison will be invited to attend.

Occupying the entire northern half of the second floor of the Palace, the electric vehicle exhibit will be a show in itself. It will consist of street trucks, industrial trucks, storage batteries, battery-charging equipment and electric garage accessories. All the leading manufacturers represented in the New York metropolitan district will arrange displays. Charts will present interesting data on traffic conditions.

Iowa Southern Utilities Takes in Iowa Gas & Electric

One of the most important mergers of public utility properties in Iowa this year was announced when the Iowa Southern Utilities Company, of which George M. Bechtel of Davenport is president, effected a consolidation with the Iowa Gas & Electric Company, which has its headquarters at Washington, Iowa. Through this merger the Iowa Southern Utilities gains a strategic group of properties which have cut off the Burlington from the Sigourney group of the Iowa Southern up to the present time. Construction of a 33,000-volt transmission line from Sigourney to Washington to tie in the properties of the Iowa Gas & Electric with the Iowa Southern has already been commenced. The merger was effected through the personal negotiations of Mr. Bechtel for the Iowa Southern and George S. Carson, president of the Iowa Gas & Electric.

The Iowa Gas & Electric serves twenty-two communities in Washington, Keokuk, Jefferson, Henry and Louisa Counties. It owns over 275 miles of transmission line and it serves a population of approximately 25,000. By connecting the Burlington and Sigourney properties with this new group, and by a further connection between Sigourney and Grinnell properties of the Iowa Southern through the Deep River-Brooklyn link, and connecting the Sigourney with the Centerville properties through the Albia-Hedrick link, the Iowa Southern will have a compact group of public utility properties dominating the southern and southeastern portions of the state.

New York Party Planks

Democratic and Republican Conventions Express Views on Water Power and Utility Regulation

NEW YORK STATE ranks first among the commonwealths of the Union in developed and among the first in potential water power. The action of her political authorities on hydro-electric development is therefore of great importance to the electric light and power interests as a national industry.

The Republican party of the state at its recent convention in Rochester adopted a long plank dealing with the question and calling for the appointment of a non-political commission to study it. This plank said in part: "The immediate problem of the state is to secure the development of its power possibilities as rapidly as possible. These power possibilities lie almost wholly on the Niagara and St. Lawrence Rivers, and therefore present complications with our federal government which must be solved before any further action can be taken. We pledge the Republican party to do everything possible to speedily determine this question with the federal government and to set up a commission of independent men capable and free of politics to study the entire subject with a view to determining the best possible plan to carry on the developments in the interests of all the people of our state."

The Democratic party adopted a short plank on water power, reading as follows: "We favor development of state-owned water power, under state ownership and control, for the benefit of all the people. We advocate the establishment of a state agency for the development of our water-power resources along the lines recommended by Governor Smith and the development of these resources by the state in the interest of the people as against their exploitation for private interests."

Regulation of Public Utilities

On public utilities the situation was reversed, the Democrats adopting a long and the Republicans a short plank. The Democrats said in part: "We maintain that every city should have delegated to it the right to regulate the quality of service rendered and the rates charged within the city by any public utility corporation, and we pledge the enactment of legislation to empower cities to compel adequate service at reasonable rates. We assert that every city should be permitted to decide for itself, by referendum vote, when convenience and necessity demand municipal ownership or operation of any form of public utility, and we pledge the enactment of legislation vesting the cities with power to own and control the operation of local transportation, light and power facilities. We favor the enactment of federal legislation which will prohibit the appointment by federal judges of receivers for municipal public utility corporations, or the issuance by such judges of injunctions restraining local authorities from administering and enforcing state laws or the provisions of franchises and contracts to which a community is a party."

The Republican plank reads: "We condemn the Democratic administration for its attempt, frustrated by the Republican Assembly, to abolish the regulation of public utilities by a non-political state commission, established in our state under the leadership of Governor Hughes and since adopted as essential by practically every other state. If such a proposal were carried into effect it would be a return to the old order under which the people did not receive adequate protection because of inevitable chaos, inefficiency and corruption."

Coolidge on Water Power

President Sees a Close Relationship Between Mining and Hydro-Electric Development

WRITING to Herbert W. Smith, prominent in the American Mining Congress, which met last week at Sacramento, Cal., President Coolidge said:

"There are certain fundamental contributions to the rehabilitation of our Western mining industries through reducing the inherent cost of operation. They lie in the further development of our great water powers and in the cheapening of the costs of living in those regions by the local production of foodstuffs and supplies.

"Indeed, the development of water power, reclamation and the rehabilitation and expansion of our metal mining industry are thus definitely related. No greater contribution can be made to the mining industry by the government than the development of these parallel contributories. Under the federal water-power act, by which leases are granted for periods of fifty years for the development of water power, and under the reclamation act, by which the government constructs water storage and its distribution, we have established policies of stimulation of such development. Generally, the full utilization of the great water supplies of the West will bring helpful aid to the whole of the other industries located in that great country.

"Those places in the West where our water resources, either in power or irrigation, are easily and readily accomplished have now in the main been exhausted, and to secure the greater development we have need to consider the larger products of more difficult and expensive engineering character.

'These problems comprise questions of storage of water on a vast scale, so as to cover the annual as well as the seasonal fluctuations in stream flow and thus to provide not only immediate supplies but protection against dry years. They involve questions of flood control, questions of power development and supply to the mines and other industries, questions of irrigation and reclamation.

"An important problem of this character lies at the door of your Congress in the properly considered storage, flood control, irrigation, reclamation and prevention of salt water encroachment in the Sacramento River Valley. Another great problem of this character lies in the Colorado River, where, as a preliminary to large engineering development, the administration has endeavored to secure a settlement of the conflict of interstate rights which has so long retarded the expansion of this locality by a treaty among the seven states that are concerned. Six states have referred this treaty, and it is hoped that the seventh will in due time give adherence.

"Similar possibilities of storage of water and development of power are presented to us in the Columbia River, and many projects of less dimensions, but of great importance to the future of our country, lie scattered over the entire intermountain region."

Progress of Farm Electrification in Alabama

The Alabama Power Company, in co-operation with the agricultural engineering department of the Alabama Polytechnic Institute and with the indorsement of the American Farm Bureau Federation, has put into operation in Alabama during recent months approximately 28 miles of rural electric lines, serving more than 275 rural customers. There are now under construction or authorized 45 miles of additional lines, which will reach more than 750 other farmers. Surveys have been made of twenty-seven additional rural communities within reasonable distance of the company's existing lines. To connect these communities will require the construction of about 70 miles of line. It is expected definite plans will be made and the necessary authorizations granted for these extensions in the near future. Their cost to the Alabama Power Company will approximate $225,000.

Although the work has not progressed beyond the experimental stage, actual results already obtained indicate an annual revenue from the lines now in operation of $15,000 from 275 customers, including community projects, such as cotton gins, grist mills, ice plants, etc., with an investment of a little more than $60,000 in distribution lines to serve these customers.

Wisconsin Company Plans to Electrify Dairy Farms

The Southern Wisconsin Electric Company has obtained a conveniently situated dairy farm in its Lake Geneva territory on which it purposes to electrify all operating methods. It will equip one farm with the existing appliances in order to show their desirability and economy. Electricity will not only light the buildings and pump the water, but will also be used for refrigerating the milk in the dairy and operating the kitchen refrigerator. Water for dairy use as well as for the laundry and kitchen will be heated by electricity. An electric range will be installed for cooking, and the laundry will be equipped with electric washing, drying and ironing machines. The barns will be electrically ventilated and an electric motor will drive the vaporizer for oil burners used in heating the house.

In carrying out its plans the Southern Wisconsin Electric Company has arranged for the co-operation of the Wisconsin College of Agriculture, the Wisconsin Farm Bureau and the Borden Farm Products Company. The entire investment and all expense of equipping the farm will be borne by the company, and the demonstration will be continued over a period of years in order to get the average results and actual costs. Accurate records of the operation of the farm will be kept, which will be available for public inspection.

The Wisconsin Light, Heat & Power Company, of which G. C. Neff is the operating head, is conducting experimental and research work on several farms near Ripon, Wis., to develop new farm equipment suitable for electrical operation. The Southern Wisconsin Electric Company will as rapidly as it becomes practicable place this new machinery in use on its central-station farm.

Farm-Service Exhibit at Minnesota State Fair

A comprehensive exhibit of the use of electricity on the farm was given a week or two ago at the Minnesota State Fair. The exhibit was arranged by the Minnesota Committee on the Relation of Electricity to Agriculture, of which James F. Reed is chairman and Charles F. Stuart of the Northern States Power Company an active member.

Space was not sufficient to enable the committee to give actual demonstrations of feed grinding, corn shelling and similar operations, but it laid out a model farm and installed a live miniature electric line which lighted the yard, house and outbuildings. Real chickens ran in and out of an electric brooder. Placards helped tell the story, and it is estimated that nearly a quarter of a million persons stopped to look at the exhibit, many of them asking for detailed information, which was supplied through a carefully prepared booklet.

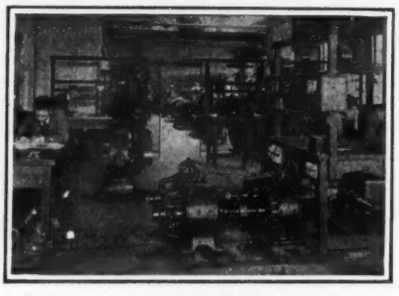
Joint Study of Refractories with Bureau of Mines

C. A. Hirshfeld, chief of the Detroit Edison Company's research department, representing a group of prominent central-station companies, has entered into a co-operative agreement with the Bureau of Mines at Washington for a comprehensive survey of present conditions relating to the use of refractory materials by power plants. The work will be carried out under the direction of engineers of the bureau. The present high ratings at which central-station boiler plants are being operated and the increasing use of pulverized coal with attending high temperatures have brought out the desirability for a complete study of present-day refractories available for boiler linings. In the survey to be made the characteristics of refractory linings now found on the market will be examined, attention being paid to the conditions under which they are used, their life in operating practice under prevailing central-station performance and the manner in which failures occur.

Rensselaer Celebrates

Technical College at Troy, N. Y., Has Its Hundredth Anniversary—Notable Gathering

FRIDAY and Saturday, October 3 and 4, witnessed a notable gathering at Troy, N. Y., to celebrate the centenary of the Rensselaer Polytechnic Institute, which is believed to be the oldest engineering school not only in the United States but in any English-speaking country. Among prominent foreign engineers present as invited guests were Henri Abraham, former president of the Society of Electrical Engineers of France; Luigi Luiggi, president of the Society of Civil Engineers of Italy; Sir Charles Morgan, president of the Institution of Civil Engineers of Great Britain, and Arthur Surveyer, president of the Engineering Institute of Canada. Others who took part were Herbert Hoover, Secretary of Commerce; Dr. Frank P. Graves, State Commissioner of Education; James R. Angell, president Yale



PART OF RENSSELAER ELECTRICAL LABORATORY

University; Edward A. Birge, president University of Wisconsin; Samuel W. Stratton, president Massachusetts Institute of Technology; Dr. Albert A. Michelson, president National Academy of Sciences; Carl E. Grunsky, president American Society of Civil Engineers; Fred R. Low, president American Society of Mechanical Engineers; William Kelly, president American Institute of Mining and Metallurgical Engineers, and Farley Osgood, president American Institute of Electrical Engineers.

Secretary Hoover conveyed the congratulations of the President and said: "At the time of the foundation of this institution the application of science was an accident, left to the hands of the artisans and mechanics. The real contribution of the institution has been that it grasped the duty of lifting the application of science from the rule of thumb of the artisan to the mobile hands of a skilled profession—a profession that ranks today, in its requirements of training, in intellect and in ideals, with the highest of professions."

President Palmer C. Ricketts of Rensselaer Polytechnic spoke for the institute of which he is the head, and degrees were conferred on Dr. Michelson, Mr. Grunsky, Mr. Low, Mr. Kelly and Mr. Osgood, Dr. Angell, Dr. Birge, Dr. Stratton and Dr. Livingston Farrand, president of Cornell University.

Mid-West Interconnection

How Six States Are Being Linked Together Through Lines of Many Companies

A SUMMARIZED account of the progress being made by electric light and power companies of the Mississippi River Valley in interconnecting transmission systems is given by the Illinois Committee on Public Utility Information, which says that the electric transmission line now being constructed between Rome and Peoria, Ill., will provide the connecting link between companies whose systems serve communities in Illinois, Wisconsin, Indiana, Michigan, Iowa and Kentucky.

The new line just referred to will connect the systems of the Public Service Company of Northern Illinois and those of the Central Illinois Light Company at a point near Peoria. The latter company interconnects with the Central Illinois Public Service Company, which in turn connects with the East St. Louis Light & Power Company through the Illinois Power & Light Corporation. To the north the Public Service Company of Northern Illinois lines join with those of the Illinois Northern Utilities Company, whose lines meet those of the Northern States Power Company and the Wisconsin Power & Light Company.

MANY COMPANIES INTERCONNECTED

Eastward the Central Illinois Public Service Company and Interstate Public Service Company, which serve towns in Indiana, are interconnected, and both connect with the Indiana Hydro-Electric Company. The Interstate company has connections with the Central Indiana Power Company, which joins the lines of the Kentucky Utilities Company. The Interstate Public Service Company, through other companies, interconnects with lines in southern Michigan. At the west this interconnected system, as outlined, joins with Iowa electric distributing lines which draw energy from the power dam at Keokuk.

With the construction of only 5 miles of transmission lines, from Norwalk to Wilton, Wis., the companies will be joined with lines of the Northern States Power Company serving towns and cities in the Northwest and interconnecting with lines as far west as Platte, S. D. This would include Minneapolis and St. Paul. A few short lines in Wisconsin would make the electric system of the Iron Mountain range a part of this Central West power pool.

FURTHER CONNECTIONS PREDICTED

The interconnection also extends east to Fort Wayne, Ind. The Ohio Power Company has plans to connect its system with lines of the Indiana Service Corporation at that place. The Ohio company interconnects with the West Penn system, which operates east to the outskirts of Baltimore.

Further west, in Nebraska, Kansas and Colorado, there has been extensive interconnecting of small electric systems. These systems are being joined together rapidly, and the extension of interconnections from the Atlantic Coast to the Rocky Mountains is, in the view of some enthusiasts, not far distant.

Briefer News

New Unit at Roosevelt Dam. — A 10,000-hp. hydro-electric unit which will further utilize the waters impounded by Roosevelt Dam on the Salt River in Arizona has recently been placed in operation by the Salt River Water Users' Association.

Pacific Gas & Electric Men Break World's Record in Tunnel Construction. —The construction crews of the Pacific Gas & Electric Company working on the intake heading of the tunnel for the Pit No. 3 plant in Shasta County, Cal., broke a world's record in tunnel construction in August by completing 600 ft. and in the last three days of the month made a world's daily record of 25 ft.

American Welding Society to Meet in Cleveland.—The fall meeting of the American Welding Society will be held in the Hotel Winton, Cleveland, on October 30 and 31. At the technical session on Friday morning papers on the general subject of applications of welding in the construction of bridges, buildings, etc., will be presented. The General Electric Company will show the actual process of metallic arc welding on the screen.

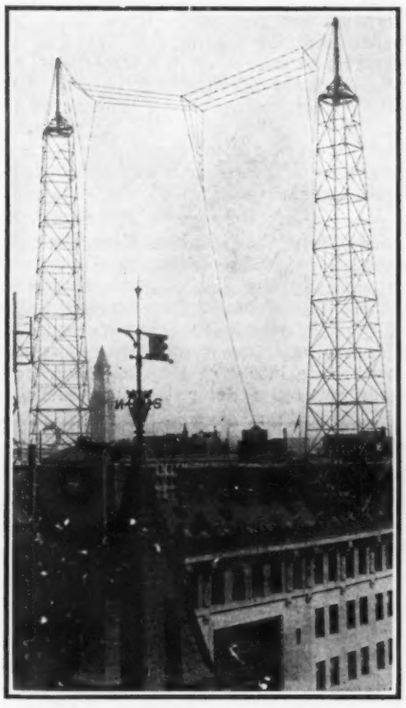
Lehigh University Establishes Research Bureau.—The Lehigh Institute of Research has been launched by the administration of Lehigh University, Bethlehem, Pa., and a staff of experts will under its auspices undertake investigations in scientific and economic fields and publish the results. Prof. William Esty, head of the department of electrical engineering, will be one of thirteen members of the faculty who will form the executive board.

Southern Power Company Completes Plant Near Spartanburg.—The steam plant built by the Southern Power Company near Duncan, 13 miles from Spartanburg, S. C., is completed. It will have a generating capacity of 30,000 kw., divided between two General Electric 15,000-kw. units, and was built at a cost of $2,000,000. The station will be used as a supplementary source of power to the hydro-electric plants owned and operated by the Southern Power Company on the Catawba River and at Tallulah Falls in Georgia.

Mechanical Engineers Elect Officers. —The American Society of Mechanical Engineers announces the result of the election of officers for 1925 as follows: President, Dr. William F. Durand of Stanford University, Cal.; vice-presidents, Prof. Robert Angus of Toronto, S. F. Jeter of Hartford and Thomas L. Wilkinson of Davenport, Iowa; managers, John H. Lawrence of New York City, Edward A. Muller of Cincinnati and Paul Wright of Birmingham; treasurer, William H. Wiley of New York.

Site for Barstow Steam Plant in South Carolina Selected.—Parr Shoals, on the Broad River, between Gaffney and Columbia, S. C., has been selected as the site for the 15,000-kw. steam plant which the W. S. Barstow interests are to build at a cost of $2,000,000. It is hoped to complete the plant by September 1, 1925. The company already has a hydro-electric plant at Parr Shoals.

Modern Publicity Equipment of a Metropolitan Central Station.—The accompanying photograph shows the radio installation erected by the Edison Electric Illuminating Company of Boston. The inauguration of this company's publicity and entertainment service was noted last week.



Cooper and Decatur (Tex.) Plants Go to Texas Power & Light.—The Texas Power & Light Company of Dallas has purchased the electric light and power plant of the Cooper (Tex.) Power & Light Company and has been granted a fifty years' franchise by the City Council. The citizens of Decatur, Tex., have voted to sell the municipal electric light and power plant to the Texas Power & Light Company and to grant that company a fifty years' franchise. The new 60,000-volt transmission line of the company passes through Decatur.

Increasing Capacity of Cape Fear (N. C.) Generating Station.—Construction work for the installation of another 15,000-kw. turbo-generator is under way at the Cape Fear steam station of the Carolina Power & Light Company near Moncure, N. C. This station started operation with one unit of this rating last December. It is tied in with the transmission systems of the Carolina Power & Light Company and its subsidiary, the Yadkin River Power Company, and will ultimately have a capacity of 60,000 kw.

Tulsa Light & Power Company Formed.—The light system in Tulsa, Okla., formerly owned by Charles Page and recently purchased by Martin J. Insull will henceforth be known as the Tulsa Light & Power Company. There will be no merger with the Public Service Company of Oklahoma, at least for some time to come.

Northern States Power to Build 75-Mile High-Tension Line to Green Bay. —The Northern States Power Company has in contemplation the erection of a 66,000-volt transmission line from White Rapids, on the Menominee River, near Amberg, to Green Bay, Wis., a distance of 75 miles. It will be a steel-tower one-circuit line, with provision for the addition of a second circuit.

Middletown (Pa.) Plant Nearly Ready.—The first unit of the new Susquehanna River base: load steam station of the Metropolitan Edison Company, near Middletown, Pa., which will be rated at 30,000 kw. and cost $4,000,000, will soon be completed. This station is to furnish light and power to Hanover, Gettysburg, York, York Haven, Middletown and other places in the territory of the Metropolitan Edison and its Hanover and Gettysburg subsidiaries and will be tied in with the Metropolitan's extensive transmission system.

Alabama Power Company to Erect Million-Dollar Office Building. — A twelve-story office building, to cost $1,000,000, is to be erected by the Alabama Power Company at Sixth Avenue and Eighteenth Street North, Birmingham. The building will present a distinctive architectural appearance and will have a frontage of 62 ft. by a depth of 140 ft. It will be occupied entirely by the company, which has been obliged by its rapid expansion to maintain offices in three separate buildings in Birmingham, and is to be completed by October, 1925.

Montana Plant More than Doubles Capacity.—October 1 was the date of the starting of a new hydro-electric unit in the plant of the Mountain States Power Company at Big Fork, Mont. The unit is an S. Morgan Smith vertical-tube waterwheel directly connected to an Allis-Chalmers 2,300-volt, 60-cycle, three-phase, 1,750-kw. generator. Three 1,000-kw., 2,300/33,000-volt Moloney transformers are part of the new equipment. Prior to the bringing in of the new unit, the plant, which is on the Big Fork River, contained two units, one of 500-kw. and one of 750-kw. capacity. This plant serves the Kalispell (Mont.) district of the Mountain States Power Company, headquarters of which are at Albany, Ore.

San Francisco Meetings of N. E. L. A. Committees.—Three days will be devoted next month to meetings of the N. E. L. A. national commercial committees to be held in San Francisco. The appliance, lighting and power committees will meet on November 19, the respective committees on customer relations, electric coooking and heating,

electric domestic refrigeration and transportation will meet on November 20, and on November 21 there will be a general conference of the national committees of the Commercial Section, as well as a meeting of the Commercial National Section executive committee.

Port of Kalama, Wash., Files on Kalama River.—Forecasting a possible power development on the Kalama River, the port of Kalama has made application to the State Supervisor of Hydraulics to appropriate 500 sec.-ft. of water and to build a reservoir to impound 500 acre-ft. According to the application, the water is to be conveyed by conduit 7¼ miles, the plant will develop 11,350 hp. and the estimated cost is $1,100,000.

Barbadoes Island Plant Formally Opened. — The new Barbadoes Island steam-electric plant of the Counties Gas & Electric Company of Norristown, Pa., which has been in operation eighteen months, was formally opened on September 24 in the presence of engineers, borough officials and business men from miles around. This station, situated in the Schuylkill River, near Norristown, will have an ultimate capacity of six 22,500-kw. generating units. Two of these have gone into commission. The plant as it stands has cost $4,500,000. The station serves a wide territory in Montgomery, Chester and Delaware Counties, including many Philadelphia suburbs.

Oconto (Wis.) Gets Rid of Duplicate Plants.—Clement C. Smith, Milwaukee, president of the Wisconsin Public Service Corporation, has announced the purchase of the Oconto Electric Company. About two years ago Mr. Smith's company purchased the Oconto Public Service Company, which also operated in Oconto. Oconto was the last city in Wisconsin where the wasteful practice of duplicate electric service by two differently owned utility companies existed. Litigation between the companies was constant and often was carried through to the Supreme Court. As a result of the purchase Oconto will for the first time be assured of ample power service for all its needs. Sawdust from the lumber mill will be used as fuel and 3,000,000 kw.-hr. will be developed annually instead of 750,000 kw.-hr., the present output.

Another Hydro-Electric Project for Mexico.—Construction of a large hydro-electric power plant in the mountains near Monterey is proposed by Barton Monroe of London and associates, according to M. F. Lewis, consulting engineer, who is in Mexico investigating the situation. It is said that the project will involve the building of one or more large dams for the storage of water and the construction of a generating plant and extensive power transmission system. More than 200,000 hp. will be generated, according to the preliminary plans. Power will be furnished to the extensive industrial plants of Monterey and to mining camps in the district. Electrification of the division of the National Railways of Mexico between Monterey and Saltillo is among the possibilities.

Georgia Railway & Power Completes Improvements at Atlanta Steam Plant. —The Georgia Railway & Power Company has just completed the modernization of its steam auxiliary plant at Atlanta, at an expense of more than $700,000. Besides an extension of the building, new boilers, stacks and mechanical stokers and much new electrical equipment were added. The steam power plants operated by the company in Atlanta now have ample generating capacity to meet the demand for power for the street-railway and lighting systems in case of interruption on the main lines from the hydro-electric station at Tallulah, as well as to take over in a large measure the commercial demand in the city. Modernization of steam plants in Atlanta and in other sections of the state has involved a total expenditure during the year of more than $6,000,000, company officials say.

Manitoba Communities Fear Deprivation of Hydro Power Source.—A protest against granting the right to reconstruct the Norman Dam in the Rainy River district, in the extreme west of Ontario, and use it for power purposes was made lately to the Dominion government by a delegation representing the Provinces of Ontario and Manitoba, the Ontario Hydro-Electric Power Commission, the city of Winnipeg and the Winnipeg Electric Railway. The Manitoba government, the city of Winnipeg and the Winnipeg Electric Railway, which have extensive power interests, fear having to pay exorbitant sums for storage water. The low water at the Winnipeg River watershed and the rapid increase in the use of power in that area have made the Lake of the Woods, into which the Rainy River discharges, one of the most valuable storage reservoirs in Canada. A joint-control agreement satisfactory to all the interests concerned has, it is announced, been reached between the Dominion government and the Backus company, the commercial organization concerned.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

American Institute of Electrical Engineers—Pacific Coast convention, Pasadena, Cal., Oct. 13-17. F. L. Hutchinson, 33 West 39th St., New York.

American Institute of Mining and Metallurgical Engineers—Birmingham, Oct. 13-15. F. F. Sharpless, 29 West 39th St., New York.

International Association of Municipal Electricians—Partridge Inn, Augusta, Ga., Oct. 14-17. W. R. Arbuckle, Bayonne, N. J.

Electric Power Club—Greenbriar Hotel, White Sulphur Springs, W. Va., Oct. 20-23. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

American Society of Civil Engineers —Hotel Tuller, Detroit, Oct. 22-25. C. E. Beam, 29 West 39th St., New York.

Kansas Public Service Association—Broadview Hotel, Emporia, Kan., Oct. 24-25. R. T. Smalley, Kansas Electric Power Co., Emporia.

Illuminating Engineering Society, Briarcliff Manor, N. Y., Oct. 27-31. N. D. Macdonald, 29 West 39th St., New York.

National Association of Railway and Utilities Commissioners — Phoenix, Ariz., Nov. 11-14. James B. Walker, New York Transit Commission, New York.

West Virginia Public Utilities Association—Charleston, W. Va., Nov. 14-15. Bliss McCrum, secretary.

Electrical Credit Association (Middle and Atlantic States)—Philadelphia, Nov. 14. F. P. Rose, Marquette Bldg., Chicago.

Electrical Supply Jobbers' Association —Hotel Cleveland, Cleveland, Nov. 19-21. Franklin Overbagh, 411 South Clinton Street, Chicago.

American Society of Mechanical Engineers—New York, Dec. 1-4. C. W. Rice, 29 West 39th St., New York.

Community Light & Power Company Buys Utilities from North American.—Electric light and power and other utility plants in southeast Missouri which were bought by the North American Company last year from the Light & Development Company have been resold, subject to the approval of the Missouri Public Service Commission, to the Community Light & Power Company. The group comprises the former plants of the Missouri Public Utilities Company, furnishing energy to Cape Girardeau, Sikeston, Charleston and about a score of other small places. President L. H. Egan of the Union Electric Light & Power Company of St. Louis, in the interest of which the North American Company bought the properties, is quoted as saying that long-distance transmission from St. Louis to the southeastern part of the state had been found not to fit well with the plans for the new Cahokia power station. The Community Power & Light Company, of which Wiley F. Corl of St. Louis is president, is said to have paid $3,000,000 for the properties and contemplates a two-million-dollar development program in addition.

Draper Corporation Electrifying Plant.—Brief reference has been made in these columns to the recent decision of the Draper Corporation, loom manufacturer at Hopedale, Mass., to electrify its entire plant and to install service supplied by the New England Power Company on a fifteen-year contract. Work is now under way on this job, and when it is completed all the reciprocating engines in this factory will be torn out and junked and the new service furnished through a 5,000-kva. industrial substation to be erected by the Draper corporation. The maximum demand upon the power company is estimated at about 2,500 kw., and the annual energy consumption at about 5,500,000 kw.-hr. Connection will be made to the New England Power Company's system at the Uxbridge (Mass.) steam plant, which will be tied to the Draper installation by a double-circuit wooden-pole line 6 miles long of No. 2/0 copper and operating at 13,200 volts. About 1,000 kw. load in the Draper establishment is already motorized and is being carried for the time being on a steam turbine in the Draper power house. The mill motor service will be at 550 volts.

Men of the Industry

A. C. Cummins President-Elect of A. I. and S. E. E.

Alden C. Cummins, superintendent of the electrical department of the Carnegie Steel Company, Duquesne, Pa., whose election to the presidency of the Association of Iron and Steel Electrical Engineers was announced in a recent number of the ELECTRICAL WORLD, is a native of Pittsburgh and a graduate of Lehigh University in electrical engineering. Following a short association with the South Penn Oil Company, Folsom, W. Va., he became affiliated with the Westinghouse Electric & Manufacturing Company as a cadet engineer, later entering the engineering department. Mr. Cummins has been identified with the Carnegie Steel Company since 1911, when he became assistant electrical engineer at the Duquesne Works. The next year he was promoted to be assistant superintendent of the electrical department and served in that capacity for six years. As superintendent of the electrode and ferro-alloy departments from 1918 to 1920 he developed and operated the only ferro-alloy and electrode departments ever established in the steel industry. For the past four years he has been superintendent of the electrical department in charge of electrical engineering and operation. Mr. Cummins has been prominently identified with the representative engineering societies, including the A.I.E.E., the American Electrochemical Society and the Western Pennsylvania Engineers' Society and has served as chairman of the Pittsburgh Section, national director and vice-president of the association which he has just been elected to head. He has contributed various technical papers to the proceedings.

A. C. CUMMINS

Paul E. Widenor, formerly manager of the New Jersey Power & Light Company's Lambertville office, has been transferred to Dover, where the company has its main offices, to assume larger duties.

Carroll A. Dean, formerly manager of the appliance departments of the Cambridge (Mass.) Electric Light Company and the Connecticut Light & Power Company, Waterbury, Conn., has been appointed manager of the same department in the Lowell (Mass.) Electric Light Corporation.

F. E. Weymouth, chief engineer of the Bureau of Reclamation, Washington, D. C., has resigned to accept private employment. As chief engineer Mr. Weymouth has been in charge of thousands of workers in the West, where he supervised the construction of the great Arrowhead Dam in Idaho.

Samuel M. Clement, Jr., a member of the Pennsylvania Public Service Commission since 1919, has resigned. After being graduated from the law school of the University of Pennsylvania in 1897, he was appointed Assistant District Attorney, remaining in that office for three years. When Mr. Clement joined the commission in 1919 it was to fill out the unexpired term of William A. Magee, but later he was reappointed for a full term of ten years.

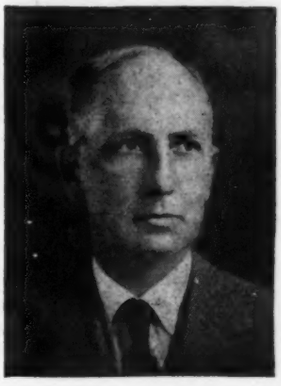
Charles E. Neil, who has been affiliated with the National Electric Light Association for the past four years, has recently joined the North American Company, New York, in charge of public information. A native of Ohio, Mr. Neil moved to Colorado and spent from 1907 to 1914 in the traffic departments of Western railroads. Upon the creation of the Public Utilities Commission of Colorado in 1914 he became rate expert. During his period of service with the National Electric Light Association he was editor of *Rate Research*, and subsequently also edited the annual rate book and *Proceedings* and the *N. E. L. A. Bulletin*.

J. C. Clark, until recently associate professor of electrical engineering at Stanford University, has resigned to accept a professorship in the electrical engineering department of Iowa State College. In his new position he will direct the work of graduate students and the conduct of research. Mr. Clark has been a member of the staff at Stanford for twelve years and has been active in the affairs of the American Institute of Electrical Engineers, having contributed a number of papers and served as chairman of the San Francisco Section of the Institute. He is an alumnus of Iowa State College and of Harvard University.

John J. McKenna was elected secretary-treasurer of the Louisville (Ky.) Gas & Electric Company at a recent meeting of the board of directors to succeed T. B. Wilson, who was elected vice-president and general manager, as was announced in the September 13 issue of the ELECTRICAL WORLD. Mr. McKenna has been connected with the auditing departments of the company and allied corporations since 1915, when he entered the auditing department of the Northern States Power Company. One year later he was transferred to the Chicago office of H. M. Byllesby & Company, and in 1919, after two years' service in the World War, was appointed auditor of the Louisville company.

D. C. Barnes in Boston

Donald C. Barnes, who was recently promoted to be a vice-president of the Puget Sound Power & Light Company, with headquarters in Boston, as was announced in the September 20 issue of the ELECTRICAL WORLD, is well qualified to occupy this executive post as the result of nineteen years of service with the Stone & Webster organization. A native of Cambridge, Mass., and a graduate of Harvard, Mr. Barnes spent some time in the East and South as an employee of Stone & Webster before becoming identified with their properties in the West. In the summer of 1911 he relinquished his duties as superintendent of the Pawtucket (R. I.) Electric Company to assume the managership of the Everett (Wash.) Railway, Light & Water Company and the Seattle-Everett Traction Company. From 1911 to 1919 he remained in Everett, in the latter year being transferred to Seattle as manager of that division of the Puget Sound Traction, Light & Power Company, now the Puget Sound Power & Light Company.



D. C. BARNES

Colonel William Kelly, chief engineer of the Federal Power Commission, will spend the month of October on an inspection tour of water-power projects in the West.

Samuel Insull, president of the Commonwealth Edison Company, Chicago, sailed for Europe on Saturday, October 4, aboard the White Star liner *Olympic*. Mr. Insull will return to the United States at the end of the month.

Charles H. Talmage, who has been associated with the Western Electric Company for more than twenty-two years, has resigned to locate in California. During this period of service

Mr. Talmage acted as sales manager of the Kansas City (Mo.) office, the Salt Lake City office and more recently of the Omaha branch.

W. F. Raber New Manager in San Diego

William F. Raber, who has been transferred by the Byllesby company to San Diego, Cal., to take over the management of the San Diego Consoli-

W. F RABER

dated Gas & Electric Company, as was announced in the September 6 issue of the ELECTRICAL WORLD, for the past thirteen years has been general manager of the Southern Colorado Power Company, Pueblo, Col. He succeeds H. H. Jones, who was recently transferred to Minneapolis, and Gen. George H. Harries, who assumed the management of the San Diego company temporarily, pending the appointment of a permanent vice-president and general manager. Starting in the utility business in 1891 with the Central Union Telephone Company of Ohio, Mr. Raber later affiliated himself with an electric light and street-railway company under the Byllesby management at Mansfield, Ohio. In 1905 he was placed in charge of the Enid (Okla.) Electric & Gas Company and the following year he was made general manager of the Ottumwa (Iowa) Railway & Light Company. From this position he was advanced to the office of vice-president and general manager of the Arkansas Valley Railway, Light & Power Company at Pueblo, Col., which was renamed the Southern Colorado Power Company at the time when all divisions were consolidated under one management.

H. F. Cameron, formerly connected with the commercial department of the Arkansas Light & Power Company, has been appointed assistant treasurer and general manager of the Tulsa (Okla.) Light & Power Company. Previous to his association with the Arkansas utility Mr. Cameron was vice-president and general manager of the Texas Gas & Electric Company, with headquarters at Houston, having received that appointment after serving as manager of the Lake Charles (La.) Railway, Light & Water Works Company. Before joining the last-named company he was affiliated with the Westinghouse interests for several years, as district manager at New Orleans for nine years and later with the Westinghouse Lamp Company in New York.

F. K. Woodring, formerly vice-president and general manager of the Northwestern Ohio Railway & Power Company, Oak Harbor, recently acquired by the Doherty interests, has assumed new duties in Columbia, S. C., where he is associated with the General Gas & Electric Company.

Marshall Dale, formerly manager of the investment department of the Kentucky Utilities Company, Louisville, has been made head of the investment department of the Interstate Public Service Company, with headquarters in Indianapolis. Both these properties are subsidiaries of the Middle West Utilities Company.

Norman Read, vice-president and general manager of the Colorado Power Company, recently consolidated with the Public Service Company of Colorado, has resigned from the service of the latter company to become associated with the Electric Bond & Share Company, with headquarters in New York.

T. N. Wynne New Head of Indiana Association

Thomas N. Wynne, who was elected president of the Indiana Electric Association at the recent convention in French Lick, as was announced in the September 27 issue of the ELECTRICAL WORLD, is the vice-president in charge of operation of the Indianapolis Light & Heat Company. Before being graduated from the mechanical engineering course at the University of Wisconsin, Mr. Wynne spent several years with the General Electric Company and with the Crane Company. In 1914 he affiliated himself with the Indianapolis utility, working his way up from the ranks to his present position, to which he was appointed last February. Mr. Wynne has taken an active interest in association affairs, having been a member of the prime movers committee of the Great Lakes Division of the National Electric Light Association, and at the present time he is chairman of the Indianapolis Section of the American Society of Mechanical Engineers.

T. N. WYNNE

Obituary

Oscar Duane Smalley, instructor in electrical engineering, Iowa State College, Ames, died September 8. Previous to his appointment to the Iowa State staff Professor Smalley had been associated with the American Electric Company, St. Joseph, Mo., and with V. L. Hollister of Lincoln, Neb. He was a graduate of the University of Nebraska.

Charles Edwards Downton, Sr., who for nearly thirty years had been identified with the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., died suddenly September 28. A graduate of Purdue University, Mr. Downton entered the employ of the Westinghouse company as a student apprentice. In 1896 he was placed in charge of the dynamo testing department, and in 1902 he entered the educational department to supervise the training courses for graduate students. When the Westinghouse company entered into the manufacture of war munitions, Mr. Downton was transferred to the New England Westinghouse Company at Springfield, Mass., where he remained until after the close of the war. Early in 1923 he returned to the main plant of the company at East Pittsburgh, where he has been identified with large electrification projects.

Clarence Sumner Titus, electrical engineer with the Wheeler-Green Electric Company, Rochester, N. Y., died at his home in that city, September 28, following a six months' illness. He was born at Henrietta, N. Y., and after establishing residence in Rochester entered the employ of the former Rochester Railway & Light Company. Since 1902 he has been chief electrical engineer in the motor department of the Wheeler-Green Company. Mr. Titus was fifty years of age.

John T. Culbertson, founder of the Allentown Electrical Devices Company, Allentown, Pa., died at his home in that city September 30, following an illness of two and a half years. Mr. Culbertson was sixty years of age.

Lawrence Birks, chief electrical engineer of the hydro-electric branch of the Public Works Department, Wellington, New Zealand, died during the summer. Mr. Birks had been in the employ of the New Zealand government since 1906, when he entered its service as an engineer, subsequently being made assistant electrical engineer in charge of the development of water power throughout the domain. In 1919 he was appointed chief electrical engineer in that branch. Mr. Birks was fifty years of age.

Financial and Corporate

Utility Prices Waver

Flurries Appear in Market with a Mixture of Gains and Losses for Week

THE news of the week brought explanation for the rise a week ago in the United Light & Power Company's stock which was then the feature of the advance. The merger of this company with several important utilities of the Middle West was the most interesting topic discussed in the utility markets, and it stimulated considerable trading in the issues involved. Continental Gas & Electric Corporation shares rose ten points almost immediately on the announcement, although a good share of this gain was lost later in the week when the general market turned weaker. The particular reason for strength in Continental Gas & Electric shares was the report that the United Light & Power Company probably would offer to purchase the Continental Gas & Electric stock still outstanding.

Outside of the flurries which this announcement caused, the market in general moved, however, with some irregularity. As the week drew to a close the listed markets turned weaker and this selling stimulated some selling of utility stocks. Commonwealth Power Corporation shares sold down several points, partly by reason of the fact that the general market was weaker and partly on account of selling in connection with the exercise of Commonwealth rights which expire October 6. American Power & Light, which for so long has been one of the market's strongest issues, lost several points as the week closed. On the big board American Water Works & Electric stock, which had been higher, sold off in sympathy with the general market. While the tone of all of the markets became more uncertain and numerous issues lost ground at times, both American Light & Traction and General Gas & Electric exhibited strength.

Five New Issues Offered During First Week of October

New bond offerings of electric light and power public utilities during the first week of October amounted to $21,175,000, five issues being floated during the seven-day period ended August 7. The largest individual offering was made by the Ohio Public Service Company, which contributed $9,000,000 to the week's total. The price of these 5 per cent bonds, due September 1, 1954, was 89 and interest, yielding over 5.75 per cent. The Public Service Company of Northern Illinois floated a five-million-dollar issue of first lien and refunding mortgage bonds, series B, at 96 and interest, proceeds from which will be used in part to reimburse the company for construction expenditures and for other corporate purposes. With the purpose of increasing the capacity of its hydro-electric plants, the Salt River Valley Water Users' Association, which controls the Roosevelt Dam and the Salt River power development, issued $4,743,000 in 6 per cent bonds, $2,500,000 of which, maturing serially from 1938 to 1943, were offered at 100 to yield 6 per cent. The remaining $2,423,000 ($665,000 Roosevelt Agricultural Improvement District No. 1 and $1,758,000 Agricultural Improvement District No. 2) are due serially from 1936 to 1954, the maturities from 1936 to 1943 yielding 5.40 per cent and those from 1944 to 1954 yielding 5.50 per cent. Another piece of new financing was the offering of the Northwestern Public Service Company to the amount of $1,332,000, the price being 100 and accrued interest. The Lockport Light, Heat & Power Company also participated in the week's activities with an issue of first mortgage 5½ per cent bonds, totaling $1,100,000.

Duquesne Light Company's Structure

This Growing Utility, Which Has a Virtual Monopoly of the Pittsburgh Business, Now Is Able to Sell Preferred Stock at 107

BY PAUL WILLARD GARRETT

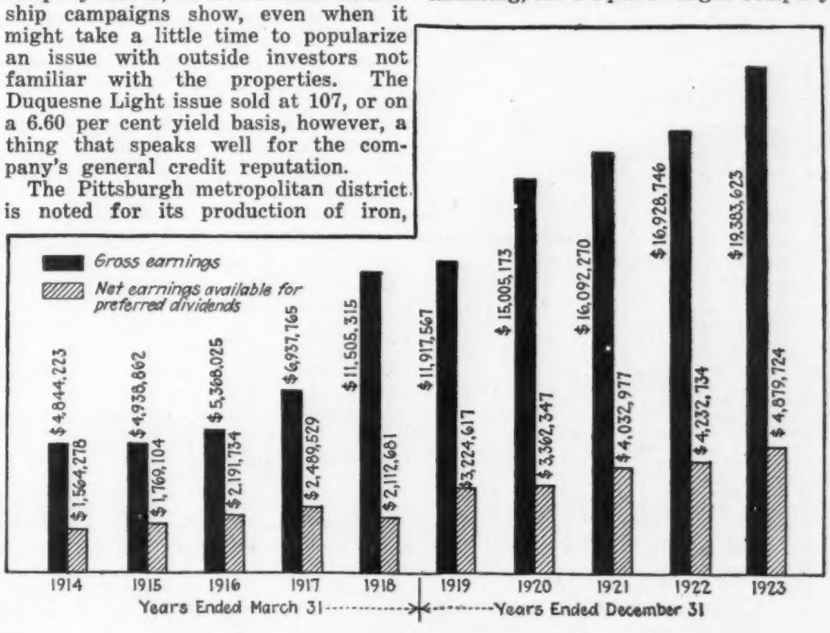
THE Duquesne Light Company, incorporated more than twenty years ago, gradually has been improving its position for a long time until now it is able to raise funds through the flotation of preferred stock at advantageous rates. Its offering of a fifteen-million-dollar issue of 7 per cent cumulative first preferred stock represents one of the more interesting pieces of recent utility financing. The incident is all the more significant in that the offering was made in the New York market and to the general investing public. The stock is to be listed on the New York Stock Exchange. Preferred stock frequently can be sold easily in the locality that a company serves, as the customer-ownership campaigns show, even when it might take a little time to popularize an issue with outside investors not familiar with the properties. The Duquesne Light issue sold at 107, or on a 6.60 per cent yield basis, however, a thing that speaks well for the company's general credit reputation.

The Pittsburgh metropolitan district is noted for its production of iron, steel, coal and coke, of course, but it is well diversified in general manufacturing enterprises. The Duquesne Light Company does substantially all of the commercial power and light business in Pittsburgh, and it does the greater part of that in Allegheny and Beaver Counties, Pennsylvania. The territory is a compact one, covering about a thousand square miles. The fact that the company, with an electrical output for the year ended August 31, 1924, of 1,064,829,780 kw.-hr., is able to do business in such a compact territory adds to the profitableness of the enterprise.

While the Duquesne Light Company does a general power and light business in the territory named, it also supplies electricity for municipal lighting purposes to Pittsburgh and supplies all power necessary for transportation purposes to the Pittsburgh Railways Company.

Upon the completion of the present financing, the Duquesne Light Company will be capitalized at $103,438,500. The ratio of bonds to stock represents a balance that authorities agree is conservative. Bonds represent $43,438,500 of the total and stocks $60,000,000.

The most prominent bond issue is the first mortgage and collateral trust



GROSS AND NET EARNINGS OF THE DUQUESNE LIGHT COMPANY

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par value of stocks is $100.)

Companies	Bid Price Saturday, Oct. 4	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	97	94	97¾
Appalachian Power, 7 per cent	89½	85½	90
Arkansas Light & Power 7 per cent	90	81	93
Asheville Power & Light 7 per cent	96	96	99
Carolina Power & Light 7 per cent	98	95½	101
Central Illinois Public Service 6 per cent	84	84	87
Colorado Power 7 per cent	93	90	97
Connecticut Light & Power 7 per cent	99	99	102
Consumers' Power 6 per cent	90	85	93
Dayton Power & Light 6 per cent	84	84	90
Duquesne Light 7 per cent	a106	102	108½
Eastern Texas Electric 6 per cent	96	81	96
Empire District Electric 6 per cent	73	70	78
Fort Worth Power & Light 7 per cent	99	97	102
Great Western Power 7 per cent	98	96	99
Illinois Northern Utilities 6 per cent	82	82	87
Illinois Power & Light 7 per cent	92	84	95
Kansas Gas & Electric 7 per cent	93	92	97
Long Island Lighting 7 per cent	98½	95	98½
Minnesota Power & Light 6 per cent	88	78	89
Mississippi River Power 6 per cent	87	80	90
Nebraska Power 7 per cent	95½	89	99
Niagara Falls Power 7 per cent—25	a 28½	27	29
Niagara, Lockport & Ont. Power 7 per cent	101½	99½	104½
Northern States Power 7 per cent	93	91	97
Ohio Public Service 7 per cent	94	86	100
Pacific Gas & Electric 6 per cent	90	85½	92½
Penn-Ohio Power & Light 7 per cent	91	84	96½
Pennsylvania Power & Light $7—no par	98	93	99
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	a 38½	29¾	39⅝
Southern California Edison 8 per cent	117	112	120
Tennessee Electric Power, 6 per cent	78	71	81
Texas Power & Light 7 per cent	96	95	96½
Utah Power & Light 7 per cent	96	94	96½
Western States Gas & Electric 7 per cent	80	78	85
Yadkin River Power, 7 per cent	97½	94	97½
Holding Companies			
American Gas & Electric 6 per cent—50	44½	41⅓	46
American Light & Traction	92½	91	94½
American Power & Light 6 per cent	89½	84	91
American Public Service 7 per cent	80	84	92
American Public Utilities 7 per cent	82	73	88
American Water Works & Electric 6 per cent	a 93½	66	99
Carolina Power & Light 7 per cent	99	95½	99½
Central Indiana Power 7 per cent	89	80	92
Cities Service 6 per cent	75½	67	77
Commonwealth Power	a 74	72	82
Consolidated Gas 6 per cent—50	58	51	59½
Continental Gas & Electric 7 per cent	88	69	93
Electric Bond & Share 6 per cent	100	96½	103
General Gas & Electric—$8—no par	103	96	103½
Middle West Utilities 6 per cent	88	80	90
National Power & Light—$7—no par	93½	84	96½
North American 6 per cent—50	a 48	43¾	50½
Northern Ohio Electric	a 25	16	34
Public Service Corp. of N. J. 7 per cent	a 99½	96½	104½
Public Service Corp. of N. J. 8 per cent	a108½	99½	110
Standard Gas & Electric 8 per cent—50	48½	46¾	49½
‡United Gas Improvement—50	56½	55¼	58
United Light & Power—$6.50—no par	83	75¼	84
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	32½	22½	34
Appalachian Power—no par	72	66½	93
Arkansas Light & Power	60	22	63
Brooklyn Edison	a 118	107½	120
Buffalo General Electric	149	118	155
Carolina Power & Light	230	82½	245
Colorado Power	33	21	35
Commonwealth Edison	132	126	135
§Consolidated Gas, Electric Light & Power	a 148½	108	148½
Dayton Power & Light	160	70	160
Detroit Edison	a 108½	102½	110½
|| Edison Electric Illuminating of Boston	a 181	163½	190
*Kentucky Hydro-Electric	87½	84	87½
Long Island Lighting	175	100	195
Mississippi River Power	33	18½	34
Montana Power	a 65½	61½	71
Niagara Falls Power—no par	42	42	48
Niagara, Lockport & Ontario Power—no par	51	45	59
Northern Ohio Electric—no par	10	5	16
Northern States Power	101	92	106
North Texas Electric	61	58	84
Pacific Gas & Electric	a 97½	90½	99½
‡Penn Central Light & Power—no par	59½	57	60
Pennsylvania Water & Power	107	98½	110
‡Philadelphia Electric—25	a 38½	29	39½
Public Service Co. of Northern Illinois	97	97	104
Puget Sound Power & Light	52	43½	61½
Southern California Edison	98	95	106
Tampa Electric	a163	134	163
Tennessee Electric Power—no par	42	20	43
Virginia Power	58	16	70
Virginia Railway & Power	a 63¾	36	72¾
West Penn. Co.	a 88	47½	98

Companies	Bid Price Saturday, Oct. 4	Low 1924	High 1924
Holding Companies			
‡American Electric Power—50	62	22½	62½
American Gas & Electric—no par	93	43½	97
American Light & Traction	136	115	140½
American Power & Light (old)	a480	200	480
American Power & Light (new)	46	34½	48½
American Public Utilities	84	35	97
American Water Works & Electric	a117	40	126½
Carolina Power & Light—no par	228	103	240
Cities Service	143	140	155
Columbia Gas & Electric—no par	a 43½	33	44½
Commonwealth Power Corp.—no par	102½	56	109
Consolidated Gas—no par	a 72½	60¾	75½
Continental Gas & Electric	90	49	96
Federal Light and Traction	a 86½	75	86½
General Gas & Electric	61½	22	63
Lehigh Power Securities—no par	88½	31	89
Middle West Utilities—no par	76	41	86
National Power & Light—no par	175	60	190
Philadelphia Co.—50	a 48½	42¼	53½
Power Securities—no par	9	4	14
Public Service Corp. of N. J.—no par	a 61½	39	63
Standard Gas & Electric—no par	a 37½	31½	40½
United Gas & Electric (Conn.)—no par	30	14	42
Utah Securities	33½	16½	37
BONDS			
Operating Companies			
Adirondack Power & Light 6s 1950	102½	97½	103
Alabama Power 5s 1946	95½	90½	96½
Appalachian Power 5s 1941	95½	89	95½
Brooklyn Edison 5s 1949	a100	97½	102½
6s 1930	a105½	102½	106½
7s 1940	a107½	107	110½
Cleveland Electric Illuminating 5s 1939	100½	98½	101
Commonwealth Edison 5s 1943	99½	95	100
5s 1953	98½	92	99½
§Consol. Gas, Elec. Lt. & Pwr. 4½s 1935	95½	91	95½
6s 1949	105	101¼	105
Consumers' Power 5s 1936	98½	94½	99½
5s 1952	90	87	92½
Detroit Edison 5s 1933	99½	99	100½
Duquesne Light 6s 1949	a105½	103½	106½
Great Western Power 5s 1946	95	90½	96
Kansas City Power & Light 5s 1952	a 94½	89	95½
Mississippi River Power 5s 1951	96½	92	97
Montana Power 5s 1943	a 98½	95	98½
New England Power 5s 1951	99	97	100
New York Edison 6½s 1941	a112½	109¾	112¾
Niagara Falls Power 6s 1950	105½	104	105½
Northern States Power 5s 1941	a 94½	89½	94½
6s 1941	103½	101	104½
Ohio Power 7s 1951	106	103	106½
Pacific Gas & Electric 5s 1942	a 93¾	90¾	95
Pennsylvania Water & Power 5s 1940	99	96	99½
‡Philadelphia Electric 5s 1966	a101½	97	103½
5½s 1947	103¾	99½	103½
6s 1941	107	103½	107½
Portland Electric Power 6s 1947	a 95½	89½	95½
Southern California Edison 5s 1939	99½	96	100
6s 1944	102½	100	103½
Tennessee Electric Power 6s 1947	a 98	93¾	98¼
Texas Power & Light 5s 1937	96½	91½	96½
Toledo Edison 7s 1941	108¾	106	109
Utah Power & Light 5s 1944	a 93½	87½	93½
Holding Companies			
Alabama Traction, Light & Power 5s 1962	81½	65½	83
American Gas & Electric 6s 2014	95½	94	95¾
American Power & Light 6s 2016	94½	91	94½
Amer. Water Works & Electric 5s 1934	a 92½	84½	94
Central Indiana Power 6s 1947	94	88	95
Commonwealth Power 6s 1947	a 97½	87	98
Consolidated Cities Lt., Pwr. & Tr. 5s 1962	75	64	76
Illinois Power & Light 6s 1953	99	95	100½
United Light & Railways 5s 1932	94	87½	94
6s 1952	97½	92	97½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	100	90	100½
*National Carbon	122	112	125
Worthington Pump & Machinery (A)	a 82½	68	85
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 59½	41½	66½
American Bosch Magneto—no par	a 26½	22½	38½
Electric Storage Battery—no par	a 57½	50¾	64
General Electric	a 256½	193½	281
General Electric—10	a 11½	10½	11½
*Hurley Machine—no par	a 61½	48	64½
†Wagner Electric	25½	20	34¾
Westinghouse Electric & Manufacturing—50	a 63	55½	65
Worthington Pump & Machinery	a 43½	23½	47½
BONDS			
Canada General Electric 6s 1942	104	102½	107
General Electric 3½s 1942	a 83	80	83½
5s 1952	a104½	100	105
Robbins & Myers 7s 1952	a 75	75	91½
†Wagner Electric Manufacturing 7s	101	97	101
Western Electric 5s 1944	a 99	96	99
Westinghouse Electric & Mfg. 7s 1931	a 108½	106½	109½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price Tuesday, October 7.

obligation of 1949, an issue authorized to the amount of $100,000,000 and outstanding to the amount of $41,718,500. Three issues of stock follow the bonds. They are (1) the first preferred 7 per cent stock, which, counting the new block of $15,000,000, presently will be outstanding at $30,000,000; (2) the issue of $10,000,000 participating (second) preferred and (3) an issue of $20,000,000 of common stock.

Position of Preferred Stock

Inasmuch as the company has recently been so successful in the flotation of its first preferred stock in the New York market, it is worth while to note a few features of this issue. The stock is well protected from the standpoint of assets, to begin with. Net tangible assets of Duquesne Light Company as of August 31, 1924, including the proceeds of the present financing but deducting all liabilities other than capital stock, aggregate $62,257,096. That is the equivalent of $207 per share on the first preferred, which has just been offered at 107.

The showing also is good from the standpoint of earnings. During the last ten years, or from 1914 to 1923, gross earnings have increased from $4,844,223 to $19,383,623. Net available for preferred dividends in the same period has increased from $1,565,278 to $4,879,724. The figures can be brought down to date.

The gross earnings for the twelve-month period ended August 31, 1924, were $20,025,638, and net available for preferred dividends $5,178,638. Annual dividend requirements on the first preferred stock, including the new block, aggregate $2,100,000. Thus the company is earning the first preferred dividend requirements about two and one-half times. Indeed, the company has been able regularly not only to meet its preferred dividend charges by a comfortable margin, but since 1914 has paid at least 7 per cent annually on the common stock.

Company Reports

Among the company reports issued during the past week for the month of August are the following:

Name of Company	Gross Revenues for August 1924	1923
Amer. Water Works & Elec....	$2,999,228	$3,068,789
Binghamton Lt., Heat & Pwr.	102,785	90,525
Blackstone Val. Gas & Elec....	347,766	337,626
Columbus Electric & Power...	172,984	179,447
E. St. L. & sub. (Alton Cos.).	110,740	116,039
Eastern Texas Electric.....	200,645	176,065
Edison Elec. Ill. of Brockton..	111,987	118,144
El Paso Electric.....	193,280	193,726
Kansas City Power & Light..	678,608	632,908
Lowell Electric Light.....	104,507	112,312
Metropolitan Edison.....	624,864	628,742
Milwaukee Elec. Ry. & Light.	1,714,521	1,734,069
Mississippi River Power.....	274,600	248,354
New England Power System..	514,913	601,500
New Jersey Power & Light...	81,839	80,057
North American.....	6,024,802	5,933,134
Northern Texas Electric.....	207,422	226,606
Northwestern Ohio Ry. & Pwr.	49,536	59,998
Pacific Power & Light.....	264,967	267,564
Penn. Central Light & Power.	284,907	279,943
Pennsylvania Edison.....	236,544	264,623
Puget Sound Power & Light..	980,893	1,001,180
Reading Transit & Light.....	252,790	265,588
Rutland Ry. Light & Power..	42,233	41,715
Sandusky Gas & Electric.....	54,643	54,635
Savannah Electric & Power...	154,326	158,432
Sayre Electric.....	16,256	15,245
Southern Canada Power.....	93,285	78,578
Tampa Electric.....	181,199	165,125
Vermont Hydro-Electric.....	58,751	65,382
West Penn.....	1,906,377	1,987,229

Dividends Declared

The following quarterly dividends were announced by central-station companies and electrical manufacturing companies during the seven-day period ended October 7:

Name of Company	Per Cent	When Payable
California-Oregon Power, pf.....	1¾	Oct. 30
Chickasha Gas & Electric, com....	1	Sept. 30
Cleveland Electric Illuminating...	2½	Oct. 15
Coast Valley Gas & El., 6% ser. A..	1½	Sept. 30
Coast Valley Gas & El., 7% ser. B..	1¾	Sept. 30
Commonwealth Edison.....	2	Nov. 1
Electrical Utilities, pf.....	1½	Oct. 15
Milwaukee Electric Ry. & Light, pf..	1¾	Oct. 31
Missouri Gas & Elec. Service, p.l..	$1.75	Oct. 15
Mountain States Power, pf.....	1¾	Oct. 20
Newburyport Gas & Electric.....	$1.50	Oct. 15
Newburyport Gas & Elec., extra..	50c.	Oct. 15
Newport News & Hamp. Ry., Gas & Elec.....	$1.25	Nov. 1
Northwestern Electric, com.....	30c.	Oct. 1
Northwestern Electric, 7% pf.....	1¾	Oct. 1
Northwestern Electric, 6% pf.....	1½	Oct. 1
Public Serv. Co. of N. Ill., 6% pf...	$1.50	Nov. 1
Public Serv. Co. of N. Ill., 7% pf..	$1.75	Nov. 1
Public Serv. Co. of N. Ill., par $100.	$1.75	Nov. 1
Public Serv. Co. of N. Ill., no par..	$1.75	Nov. 1
Southern Cal. Edison, orig. pf.....	2	Oct. 15
Western States Gas & Elec., pf....	1¾	Oct. 15
Wisconsin River Power, cum. pf...	$1.75	Nov. 20
Allis-Chalmers Manufacturing....	$1	Nov. 15

Capital Stock Increase Authorized.—Stockholders of the Shawinigan Water & Power Company have authorized an increase in capital stock of $5,000,000—from $20,000,000 to $25,000,000. The directors subsequently authorized the issuance of $2,000,000 of capital stock to stockholders at par on the basis of one new share for each ten now held.

Boston Stock Increase Voted.—The stockholders of the Edison Electric Illuminating Company of Boston voted September 16 at a special meeting to approve petitioning the Massachusetts Department of Public Utilities for authority to issue 77,857 shares of additional common stock. If authorized, it will be issued at $155 a share.

Public Utility Valuations Increased.—The Wisconsin State Tax Commission has increased the valuation of public utility companies of the state to $123,975,000, an increase of $19,500,000. Taxes on such property will amount to $2,560,968 for the year, as compared with $2,171,140 a year ago.

Radio Corporation Stocks Listed.—The class A preferred stock of the Radio Corporation of America, amounting to $19,779,870, and 1,155,400 shares of class A common stock were listed last week on the New York Stock Exchange by the board of governors. This is the first stock of a radio company admitted to the trading list, the radio stocks traded in heretofore on the Stock Exchange being stocks of companies manufacturing other products in addition to radio products.

Detroit Edison to Create New Mortgage.—The stockholders of the Detroit Edison Company will vote on October 20 on authorizing the execution and delivery of a mortgage to a trustee to be selected by the directors upon all the property real and personal and the franchises of the company, or upon such portion as the directors shall determine, in order to provide bonds to be issued and sold from time to time in such amounts as may be necessary. It is the opinion of the directors that within two or three years it will be necessary to exceed the limit now set upon the bonded debt, and with the purpose of taking the necessary steps to that end they are recommending to the stockholders at the present time the new mortgage and deed of trust.

United Light & Power Makes Offer for Continental Minority Shares.—The United Light & Power Company, which recently acquired more than 75 per cent of the common capital stock of the Continental Gas & Electric Corporation, as was announced in last week's issue of the ELECTRICAL WORLD in connection with the merger of these companies and others in the Middle West, has offered the remaining common stockholders one and one-half shares of United class B preferred stock and 1 share of class A common stock in exchange for each share of Continental common stock held.

Public Service Company Files Application.—The Public Service Electric & Gas Company has filed application with the Board of Public Utility Commissioners in Trenton, N. J., for authority to issue 5½ per cent bonds amounting to $15,000,000, proceeds to be used for capital expenditures. The board was also asked to approve an issue of common stock of 2,000,000 shares, no par value, to go to the Public Service Corporation of New Jersey for money advanced in connection with the merger of the Public Service Electric & Gas Company. The Public Service Corporation has called for payment on December 1 at 107½ and accrued interest all its outstanding twenty-year secured 7 per cent gold bonds.

Transfer of Stock Approved.—The New Jersey State Public Utility Commission has granted permission to the Eastern Pennsylvania Power Company to transfer its outstanding capital stock to the New Jersey Power & Light Company, which was also authorized to take over the capital stock of the Vulcan Power Company. The commission also gave the New Jersey Power & Light Company authority to issue 80 per cent of its proposed new stock.

Columbia Gas & Electric to Call Notes.—On November 1 the Columbia Gas & Electric Company will call for payment at par and interest 5 per cent notes amounting to $11,500,000 and due February 28, 1925. The funds to meet this obligation will be obtained from the proceeds of the fifteen-million-dollar issue of preferred stock, which, as was announced in the September 20 issue of the ELECTRICAL WORLD, was offered the company's shareholders.

Brooklyn Edison Plans Bond Issue.—The Brooklyn Edison Company has asked the Public Service Commission for authority to issue $25,000,000 general mortgage series A 5 per cent bonds, maturing in 1949, more than $10,000,000 of which will be used for refunding and the balance for capital expenditures. The issues which the company is redeeming in advance of maturity bear interest at the rate of 7 per cent.

Recent Court Decisions

Climbing Tree Belonging to Another an Act of Trespass and Injury from Wire Passing Through Tree Not Actionable.—One Parshall brought action for damages against the Lapeer Gas-Electric Company because he had been injured by contact with a transmission wire while climbing a tree belonging to another to gather walnuts. The wire passed through the top of the tree. The Supreme Court of Michigan sustained a judgment for the defendant, holding that the plaintiff was a trespasser to whom the electric company owed no duty. (199 N.W. 599.)*

Sale of Property by Lighting Company for Which Stock in Another Company Was Accepted Held Valid.—Dearborn (Mo.) Electric Light & Power Company vs. Jones involved the transfer of an electrical property by the former to the Dearborn Iron & Power Company in exchange for stock in the purchasing company. The plaintiff held that the transaction was not valid and sought to restrain the trustee of the defendant, which had become bankrupt, from selling the property in question, described as "old light-plant equipment." The United States Circuit Court of Appeals has held the transaction valid since it did not interfere with service to customers and since the plaintiff had retained the stock and allowed the defendant to make changes in and expenditures upon the property. (299 Fed. 492.)

Employer's Duty to Notify Employee of Danger.—The Supreme Court of New Hampshire has overruled exceptions taken by the defendant in the damage suit of Judkins vs. Exeter & Hampton Electric Company to the refusal by the trial judge to order a directed verdict on the ground (1) that the plaintiff, a workman who came in contact with high-tension wires while on a pole, assumed the risk of his injury, and (2) that if there was any negligence, it was that of a fellow servant. The Supreme Court held that an employer is bound to notify his employees of all dangers peculiar to the employment which he either knows or ought to know and which they neither know nor are in fault for not knowing. In a servant's action for injuries from high-tension electric wires, said the court, plaintiff's testimony that he did not know wires were charged, was not so informed, and that fellow employees informed him that defendants always shut the current off while employees were working, warranted submission to the jury of the question of employer's negligence in failing to notify plaintiff of the dangers incident to his employment. (125 At. 435.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Appeal to State Supreme Court Not Necessary Before Beginning Action for Confiscation in Federal Court.—Granting an interlocutory injunction in a suit brought against the Ohio Public Utilities Commission by the Van Wert Gaslight Company, in which rates fixed by the commission were alleged to be confiscatory, the United States District Court for the Southern District of Ohio declared that an appeal to the Supreme Court of Ohio from a determination of the Public Utilities Commission fixing rates is not necessary before the commencement of action in a federal court to enjoin enforcement of the commission's order on the ground that the rate is confiscatory. However, the court held that a judicial review by the Ohio Supreme Court of such a rate and its affirmance of the commission's finding would preclude the re-examination of the question in any other tribunal, in absence of a federal question reviewable by error process in the United States Supreme Court. While the decision of the court of last resort of a state, construing its statutes and constitution and declaring the capacity in which it acts under such constitution and statutes, is of great persuasive force, the United States court further remarked, the question of the conclusiveness of the decision depends not on the character of the body but on the character of the proceedings. (299 Fed. 670.)

Confiscatory Rates Fixed by Municipality Set Aside.—In July, 1922, the City Council of Booneville, Ark., by ordinance reduced the rates of the Coal District Power Company. The Circuit Court of Logan County set aside the rates as confiscatory and has been sustained by the Supreme Court of Arkansas, which says: "The method adopted by appellant's witnesses to ascertain the present value of the property was to estimate the reproduction value of the plant based upon the cost of labor and material covering the period from 1917 to 1922 and deducting therefrom depreciation of the property occasioned by the use thereof. Treating the reproduction cost as a proper element in arriving at the present market value of the property, it would not be proper to average the cost of labor and material entering into the reproduction of the plant during any given period. In the instant case the period selected embraced the high-peak prices of the war. The prices for labor and material prevailing as of the time the inquiry was made regarding the rates would necessarily control. The present market value of the property having been ascertained by appellant's witnesses upon an incorrect assumption renders their conclusion unreliable. When their testimony is eliminated, the only testimony of consequence remaining is that introduced by appellee tending to support the finding of the court. . . . The exhibits also reflect disproportionate increase of expenses compared with the income for operation in the years 1922 and 1923. The plant was an old one, having been in operation for a number of years. We are of opinion that the rate fixed and certified by the court is supported by the weight of the evidence." (256 S. W. 871.)

Commission Rulings

Must Foreign Corporations Publish Notice in Nebraska Before Issuing Securities There?—The Nebraska State Railway Commission, in authorizing the Nebraska Power Company, organized under Maine law, to issue and sell preferred stock, discussed the question whether a provision of the Nebraska Constitution reading, "The capital stock of public utility corporations or common carriers shall not be increased for any purpose, except after public notice for sixty days, and in such manner as may be provided by law," applies to foreign or only to domestic companies, the commission's counsel maintaining that the provision is self-executing and applies to corporations wherever organized and the company's counsel contending that it has no application to companies incorporated outside the state. In the absence of any court decision governing the question, the commission said: "The responsibility belongs to the company. It should leave no question."

Historic Costs — Value of Water Rights—Management Corporation Fees and Operating Expenses.—In establishing rate schedules for the Western States Gas & Electric Company, the California Railroad Commission refused to admit the average prices of material used in maintenance as the basis for an estimate of historical reproduction cost of a flume built in 1903, partly reconstructed in 1912 and enlarged in 1915, since the unit costs referred to gave considerable weight to the higher prices that prevailed after 1916. The commission also ruled that a utility claiming a value for water rights has the burden of demonstrating such value and that calculations of the value of water rights based upon production costs as they are as against costs as they would be if steam power were used or if the entire energy requirement of the utility were purchased from other producers are unsound. A further ruling in this case (one already noted in the ELECTRICAL WORLD, April 5, 1924, page 686) was that a fee charged by an engineering and management corporation should not be included in operating expenses in full when based upon a percentage of gross revenues, but consideration should be given only to the value of services rendered. On this point the commission said: "If the Byllesby corporation were to pay the salary of the local general manager out of its fee and not charge it to the local company, the resultant amount for general and commercial expenses would be reasonable as compared with the cost to other utilities, and the total cost under these conditions would represent an amount not in excess of a probable fair value of the services which it appears are rendered." In accordance with recent decisions of the commission, federal income tax was included as an operating expense, but bond coupon tax was deducted.

Manufacturing and Markets

Recent Status in France

An Attitude of Moderation Toward Germany Has Now Become Apparent—Reconstruction Achievements in the Devastated Regions Arouse Great Admiration

By E. J. Mehren
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JOURNEYING to France after visiting Germany and noting there the transformation of spirit and the indications of reviving strength, one naturally asks whether the French, if aware of these developments in Germany, are formulating a policy that will work toward a peaceful solution of their differences. As every one knows, the French policy to date, no matter how justified to the French mind as a means of forcing reparations or insuring security, has built up a hatred of the French in Germany. Such a feeling, taken in connection with the growing strength east of the Rhine, bodes no good for Europe.

Do the French realize what has happened in Germany? Do they foresee the possible results of the growing enmity? What policy are they formulating that will, peacefully, meet the situation? These are questions that force themselves on the visitor who, leaving Germany, goes to France.

Moderate Policy Developing

The French do realize what has happened in Germany; they are watching Germany more closely than is any other nation. The result is what might be expected of men who do not blind themselves to the facts—a growing opinion that France must develop a harmonious relationship with Germany. The view is not yet very articulate, but Herriot's more conciliatory attitude, as contrasted with Poincaré's, is tangible evidence of the growing feeling. Force is seen to be ineffective; the invasion of the Ruhr is conceded to have been a blunder.

The more friendly development, it is felt, should begin with commercial treaties, possibly commercial alliances. The German steel mills in the Ruhr, for example, can get their cheapest iron from Lorraine, now a part of France; Lorraine, on the other hand, needs German coal and can find the best market for its iron in the Ruhr. What more logical, then, than to come to agreement and to facilitate the coworking of these economically allied iron mining and coal and steel producing districts?

Of course, there are opponents, like Poincaré and his followers, of any plan that looks with reasonableness upon relations with Germany. Poincaré, however, has lost ground. The last election showed that the French want to try a new method of dealing with Germany; and the tide, judging by what could be learned in Paris, is still setting away from Poincaré and toward the development of amicable relations. Unquestionably, such a relationship between these countries would be the best assurance of peace in Europe. This the French are beginning to admit. It is a hopeful sign.

Repeatedly, in discussing these matters, it was impressed upon the visitor that France has no commercial jealousy of Germany and that her sole desire is for security against German aggression. The reparations difficulty would long since have been adjusted had security been assured. This desire accounts, in part, for the Ruhr occupation, though the invasion was defended as a means of bringing reparations payments. The Ruhr is the great steel center, the Pittsburgh of Germany. In control of this district, France could prevent material preparations for war. It seems likely, however, that she will soon retire from the Ruhr (the London pact was concluded after this was written) and the question of security will be left to later conference, possibly under the auspices of the League of Nations. But security France does want, and until she gets it, through agreement with other nations or a German alliance, it will be the controlling motive of French policy.

Admiration was recently expressed in a previous article over developments in Germany. But no less should be the admiration for the French; they have done a mighty work in rebuilding the devastated regions.

Four years ago I stood in Lens, on the site of the Hôtel de Ville (the city hall), and surveyed in every direction the worst destruction I had seen in France. It was a city beaten flat, the streets obliterated, with no vestige of the pitheads that had once marked this, the richest of France's coal-mining districts. A few weeks ago I stood on the same spot. Round about was an entire new city, housing as many people as before the war. There were gaps here and there where new buildings have not replaced the old; there is work under way in almost every street, on pavements, or sidewalks or services; there are large buildings still under construction, new churches and two banks; but for practical purposes it is a complete town, a town resurrected and at work—resurrected and at work where only desolation had reigned four years ago.

Courage Arouses Admiration

Striking as is the impression within the city of Lens itself, the impression is even stronger when one motors to the heights of Notre Dame de Lorette (where one hundred thousand French soldiers gave their lives during the war) and looks down upon the whole area. The landscape as far as one can see is dotted close with new red-roofed towns, each surrounding the shaft of a single large mine. The impression would draw admiration from the dullest—admiration of the energy, the determination, the courage of the people of France.

The company operating the Lens concession (sixteen mines) before the war employed 12,300 men underground and mined 370,000 metric tons of coal per month. On May 1 of this year 10,458 men were at work underground, and the monthly tonnage was 175,000 (working conditions are still quite unsatisfactory). Of the 8,300 houses for workmen, 7,490 have been rebuilt and the population of the mine towns (32,-

250 in 1913) is now 30,284. Thirteen out of the twenty-three destroyed working shafts have been repaired, the headworks completed and put in service, and so have eight out of the twelve ventilating shafts. Of thirty-five million cubic meters of flooding water thirty-one million had been removed.

In the rebuilding of the tipples, electric substations, washhouses for the workers and the other necessary structures the best construction and the latest equipment have been employed, so that the Lens area has the unique distinction of a whole district modernly equipped. The plant layouts are impressive for their substantial character and the entire absence of the timber structures and shabby buildings so characteristic of our mines. All the buildings are of brick, both the mine structures and the homes for the workers.

This picture of reconstruction is matched in every part of the destroyed area; in many districts, of course, there were no industries, so that this side of the Lens development is missing. For the whole of the destroyed region the figures are given in the accompanying table.

PROGRESS OF WORK OF RECONSTRUCTION IN DEVASTATED REGIONS

	Total Work to Be Done	Finished Jan. 1, 1924.
Houses and farm buildings	741,900	605,900
Farm land to be reclaimed, hectares..	1,923,000	1,788,000
Factories to be rebuilt	22,900	20,872
New roads, km.....	58,697	42,360
Railroad and other engineering structures	6,125	4,800

Finally, the population of these areas, which had before the war been 4,690,000 and which had declined to 2,075,000 at the time of the armistice, has now risen (figures of January 1, 1924) to 4,253,000.

One other comment needs to be made that the appreciation of the French accomplishment may be complete: France has herself raised virtually all the money required for this reconstruction. Her reparation receipts from Germany have covered only a relatively small part of the cost. This is a great accomplishment and one that explains the French insistence upon reparation payments. She was the chief sufferer, and if her budget is now unbalanced, it is because of her reconstruction charges. No wonder, then, that Poincaré had a strong following in a people who have placed upon themselves this very heavy burden. Let it be remembered, too, that in the wrecking of these regions France lost heavily of her income, for while the destroyed area was only one-fourteenth of the whole of France, it produced one-fifth of the income from taxes. Yet with these handicaps—diminished taxation, no outside financial help and a war-tried people—France has rebuilt her devastated regions. For practical purposes the task is done. In four years her destruction has been repaired. Full economic and social life has been restored in territory wrecked beyond any other in history.

Importance of Precision in Specifications

Case Where Wire Manufacturer Furnished Better Material Than Required and Loss Resulted

THAT specifications should always be precise and that manufacturers should be careful not to furnish material larger than called for when only a minimum is specified, especially where such a minimum is an adopted trade standard, is shown in the case outlined below concerning the filling of an order for wire. It is the usual practice when purchasing rubber insulated wire covered with cotton braid to specify, if purchased under specifications, the minimum thickness of each braid which is to be applied to the wire. This insures that the braid will be strong enough not to be damaged in handling or when pulling the wire into conduits or over cross-arms.

That a specification calling for merely a minimum thickness of the braiding is not always enough is proved by the experience of one firm of electrical contractors which purchased its wire from a large wire company and under specifications considered to cover the details of the manufacture much more closely than is usually the case. The work on which this firm was engaged called for the pulling of several wires into a single conduit, and a size of conduit had been chosen which the ordinary tables showed to be large enough to take all of the wires easily.

But at the time that the wire was made up the manufacturer was temporarily out of the proper size of cotton to be used in making the braid. A larger size was used, and although the inspector noticed that the braid was heavier than called for by the specifications, he merely thought that his company was getting good measure from the manufacturers and was to be congratulated on getting the stronger covering. However, when the attempt was made to pull the wire into the pipe it was found that the job was exceedingly difficult, though not impossible, and much time and labor was expended on the installation as compared with what would have been the case if the wire had been of the usual size. Before the work was completed it was found that much of the estimated profit had been lost due to the greater expense of pulling in the wire. While this is an unusual case, no harm will be done if a maximum, as well as a minimum, thickness of braid is called for in such specifications.

Survey of Trade Association Activities Will Soon Be Available

A LACK of a clear and definite expression of public policy toward certain forms of business activity which have grown up out of changing economic conditions jeopardizes business and industrial development, according to the National Industrial Conference Board, and raises questions of vast importance to the public and the business community. In this connection the board has been engaged for more than a year in an extensive study of the development and present status of public policy toward private business enterprise, with special reference to the application of the anti-trust laws. This study, it was announced, covers the legal and economic aspects of the development and regulation of industrial combinations and the control of various forms of business co-operation and trade practices, the financial and economic aspects of business combinations, the relation of anti-trust laws to labor and the bearing of industrial combinations upon foreign trade and international affairs. The purpose of the whole investigation, states the board, is to clarify for the public and the business community the present situation with respect to governmental policy so as to provide a sounder and more scientific basis for discussion of the vital issues which have arisen out of that situation. The investigation is being carried out by the research staff of

the board in co-operation with a group of legal and economic authorities in this field and a large body of industrial and business leaders.

Since the whole issue of public policy has been raised recently in connection with the effort of the Secretary of Commerce and the Attorney-General to define what trade associations may or may not do, the first report resulting from the board's investigations is a comprehensive survey and analysis of "Trade Associations and Their Activities." This report, to be issued shortly, analyzes the development of trade associations and the legal status and economic importance of their activities, and will focus national attention on the place of trade associations in our industrial economic structure.

Business Conditions

BUSINESS continues to show every indication of improvement and is on the up grade, though progressing slowly. In general, conditions are spotty, and it is evident that orders for material are being withheld in many cases until it is not possible to do so any longer. Sales have been generally good in the South and Southeast and on the Pacific Coast with the exception of Los Angeles; Omaha, Kansas City and Minneapolis are quiet, but an upward trend is looked for on account of the increase in wheat prices. Hand-to-mouth buying is still much practiced—a condition that has been materially fostered by very good freight service.

It is of interest to note that several railroad shops formerly on part time have increased working schedules. The Bethlehem steel-rail plant at Sparrows Point, Md., which has been idle since 1916 with the exception of occasional operations during emergencies, has opened on part time. Nearly $1,000,000 was expended in rebuilding this division. The number of freight cars ordered so far this year is nearly equal to the number ordered for all of 1923, although this has not been the case with passenger cars and locomotives.

In New England sales of supplies to industrials have improved, textile mills entering the market more actively than in months. Considerable expansion of ornamental street-lighting installations is also in progress in that section. Central-station companies are the principal purchasing factor in the New York district, and industrials are buying supplies in good volume. In the Southeast Florida continues to be the most active market. Rainy weather has materially slowed up business in some sections of this territory. There is a generally healthy demand for most commodities in the Middle West with orders increasing in size. On the Pacific Coast a fair volume of business, consisting of many orders of small size, is being transacted. Present stocks are large in this section.

Copper Consumption Shows Large Increase—Exports Higher

DURING the first six months of 1924 the domestic consumption of copper increased 10 per cent over the corresponding period of the record-breaking year of 1923, according to George A. Sloan, secretary of the Copper and Brass Research Association. This increase is partly explained by the larger use of copper in the electrical industry and the further gains shown in building construction. As a result of this some new mines have been opened, one incentive being the expectation that Germany will enter the market to buy heavily in the near future. The value of refined copper and ingots, bars and other forms exported during the first half of 1924, as obtained from the Department of Commerce, increased from $52,671,000 during the same period in 1923 to $68,702,000, or 30 per cent, while in quantity the gain was much larger, from 328,248,000 lb. to 505,142,000 lb., or an increase of 54 per cent.

"Prior to the world war," said Mr. Sloan, "consumption of copper in the United States had never reached 1,000,000,000 lb., and although there was a tremendous increase to meet military necessities between 1914 and 1919, we find that domestic consumption during 1923 was far in excess of any previous year uninfluenced by war or inflation. There is every evidence that the ratio of increase during the first six months of the current year will be maintained."

Non-Ferrous Metal Market Still Dull—Prices Firm

THE non-ferrous metal market continues to be dull with prices remaining at practically the same level. The demand for copper is small, not only for domestic consumption but also for export. Some small orders were placed at 13 cents per pound delivered for future shipment, but even at 12⅞ cents per pound purchasers generally have not displayed much interest. Export orders have declined owing to the metal being available abroad at prices that are relatively lower.

NEW YORK METAL MARKET PRICES

	Oct. 1, 1924 Cents per Pound	Oct. 8, 1924 Cents per Pound
Copper, electrolytic	12⅞	12⅞
Lead, Am. S. & R. price	8	8
Antimony	11¼	11¼
Nickel, ingot	29	29
Zinc, spot	6¼	6 55
Tin, Straits	48½	49⅜
Aluminum, 98 to 99 per cent	28	28

The official contract price of the American Smelting & Refining Company for lead continues at 8 cents. General conditions are sound and the demand has been somewhat improved, some producers reporting better sales. Others, while not noticing any increase in sales, are receiving more inquiries.

Purchasers are not much interested in the zinc market so that there is little buying, but, on the other hand, producers are not anxious to sell and are willing and able to accumulate stocks against an increase in price.

With the domestic demand for tin very much improved, the price now quoted is 49⅜ cents per pound, London responding to the American buying.

Industrial Buying Better in New England

A DECIDED improvement in sales of supplies to industries marked the week just closed, woolen and cotton textile mills entering the market more actively than for many months. Rehabilitation work in such plants in preparation for increased production is well under way, and sales of wiring supplies and industrial lighting equipment are absorbing a good deal of money. The continued open season has favorably affected the building industry and central-station outside construction. Household appliance sales are also picking up. Very little advance buying of holiday material is yet in evidence, however, on the part of retailers, and deliveries have been so prompt of late that buying in many lines does not greatly exceed current demands.

Revived activity in street lighting is noted, and considerable expansion on ornamental installations is in progress, notably in Attleboro, Mass., with a general overhauling of the entire downtown street lighting of Lowell, Mass. Conditions in the wholesale trade are a little better in Rhode Island and in the Portland (Me.) district, and in the Burlington (Vt.) section new life is apparent, eastern Connecticut also showing a more hopeful outlook. Electrical specialty manufacturers report better business, an instrument company reporting sales over 50 per cent ahead of last year.

Central-Station Purchasing Mainstay of New York District

CENTRAL stations continue to be the principal purchasing factor in the market and have been actively buying secondary equipment like circuit breakers, transformers and switchboards. Some good orders in particular have been received from a Pennsylvania utility company. However, a spirit of cautiousness in buying is evident. A manufacturer of safety switches reports that the total volume of business in this territory is very good, being better than last year, and is more than was anticipated. Sales by a large manufacturer so far in October have been very good, but, as expressed by him, it is hard to get a definite idea as to the trend in so short a time.

Industrials are still purchasing supplies in much better volume than in the last three or four months, but they are not in the market for motor equipment except in very small lots. How-

ever, several companies report many small orders which in the aggregate represent a fair volume of business. Jobbers' sales are still improving slowly but steadily, especially in sections where central-station construction is particularly active. Continued building construction is also accounting for a fair volume of sales, and radio business is active. Much interest is being displayed in industrial lighting equipment, and some good orders have been received for heating and ventilating blowers.

Florida the Most Active Market in the Southeast

THE long stretch of rainy weather in the Southeast has served to slow up materially nearly all lines of business, rendering automobile transportation throughout the territory quite difficult, and salesmen have therefore been unable until this week to cover their normal territories. The impression, however, is that with continued good weather conditions will be on the upward trend. During this month county fairs are being held all over the region and farm-lighting outfits and electric pumping equipment are being played up in the exhibitions. These two items have been slow for the past few weeks, but a stimulated movement is anticipated as a result of the fairs.

Florida continues to be the most active market in the Southeast, though the sale of distribution line materials, which has been so good during the summer, is slowing up. Sales of socket appliances in this state are very heavy. One company has recently placed an order for three carloads of electric ranges, car shipments to be spaced thirty days apart. Satisfactory orders for traffic signal equipment, telephone materials and "white way" installations are also reported from Florida, every effort being made to get ready for what is expected to be a record-breaking tourist season. Electric contracting business in Georgia, excepting for small orders, is off, this being the result of the shrinkage in building permits valued at $7,500 and over. Retail business has been somewhat slow of late, except in radio sets and equipment. The cold snap of last week served to stimulate the movement of air heaters, and satisfactory sales are reported.

Value of Electrical Exports for August, 1924, Compared with Corresponding Month in 1923

(Issued by Bureau of Foreign and Domestic Commerce)

	August 1923	August 1924
Generators:		
Direct-current:		
Under 500 kw	$39,912	$71,464
500 kw. and over	57,300	195,312
Alternating-current:		
Under 2,000 kva	5,838	16,720
2,000 kva. and over	120,357	240,892
Steam turbine-generator sets	*	7,888
Accessories and parts for generators	84,102	164,276
Self-contained lighting outfits	49,005	94,171
Batteries:		
Primary	105,505	†
Flashlight	*	61,097
Other primary	*	77,308
Storage	176,041	174,072
Transforming or converting apparatus:		
Power transformers	80,643	159,727
Other transformers	83,951	156,052
Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters	54,974	118,718
Transmission and distribution apparatus:		
Switchboard panels, except telephone	282,953	82,654
Switches and circuit breakers over 10 am	69,265	123,222
Fuses and fuse blocks	28,324	22,154
Watt-hour and measuring meters	37,854	36,122
Volt, watt and ampere meters, and other recording, indicating and testing apparatus	92,062	163,243
Lightning arresters, choke coils, reactors and other protective devices	43,727	68,416
Motors, starters and controllers:		
Motors, under 1 hp	135,523	134,397
Stationary motors:		
1 hp. to 200 hp	322,349	199,071
Over 200 hp	102,989	55,416
Railway motors	4,590	24,634
Electric locomotives:		
Railway	317,098	167,454
Mining and industrial	3,959	19,831
Other motors	10,092	†
Starting and controlling equipment	194,663	†
For industrial motors	*	156,750
For electric railway and vehicle motors	*	4,200
Accessories and parts for motors	134,872	147,193
Electric fans	63,034	73,922
Electric lamps:		
Incandescent:		
Carbon-filament	9,714	5,184
Metal-filament	87,566	114,212
Other electric lamps	12,390	26,009
Flashlights	48,575	52,700
Searchlights and projectors	$34,540	$34,897
Motor-driven household devices	87,945	71,436
Domestic heating and cooking devices	92,253	106,157
Industrial electric furnaces and ovens	51,174	11,180
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc	86,104	103,197
Signal and communication devices:		
Radio and wireless apparatus	307,127	541,238
Telegraph apparatus	21,669	30,306
Telephone apparatus:		
Magneto telephones	9,983	20,044
Other telephones	19,866	26,755
Magneto switchboards	47,351	333
Other telephone switchboards	4,387	187,762
Other telephone equipment	*	205,228
Railway signals, switches and attachments	100,077	72,806
Bells, buzzers, annunciators and alarms	13,851	17,226
Other electric apparatus:		
Spark plugs, magnetos and other ignition apparatus	194,749	122,955
Insulating material	147,600	129,481
Metal conduit, outlet and switch boxes	49,120	46,531
Sockets, receptacles and lighting switches	78,865	94,544
Other wiring supplies and fixtures	150,322	†
Electric lighting fixtures interior and street	*	112,377
Other wiring supplies and line material	*	78,283
Other electrical apparatus, not elsewhere specified	676,021	708,893
Globes and shades for lighting fixtures	42,990	30,603
Electrical glassware, except for lighting	11,312	12,818
Electrical porcelain	123,814	104,145
Electrical carbons, carbon brushes, electrodes	202,216	278,198
Insulated wire and cable (iron and steel)	75,693	25,983
Other manufactures of aluminum	204,493	103,910
Copper, bare wire	172,967	177,190
Copper, insulated wires and cables	243,178	519,413
Total electrical machinery and apparatus and supplies	$6,108,894	$7,188,370

* Not separately stated prior to January 1, 1924. † Discontinued beginning January 1, 1924.

Business in the Middle West Climbing Upward

OCTOBER'S electrical business got away to a good start in the Middle Western territory. Indications are that this month will be good. Though the volume of sales was not exceptional, a generally healthy demand for most commodities was noticed, and the increasing size of orders placed was gratifying. Reassuring evidence that the status of the farmer in the Middle West has changed was given this week in the September sales report of one of Chicago's large mail-order houses, which gives an increase of 36.12 per cent over the same period in 1923—the largest increase registered in any month so far this year, excepting February.

Central-station purchases have increased. The principal equipment contracted for this week included orders for several large synchronous converters. Pole-line hardware and poles are in good demand. The southern part of Illinois is showing signs of renewed activity in the coal-mining regions, and central stations report a subsequent increase in the power load. The jobbing trade enjoyed a normal week. In some localities the volume of business exceeded that in others, the week as a whole being good. Appliance sales are increasing. An announcement that conduit would be figured f.o.b. Evanston, Ill., was made this week.

Fair Volume of Business on the Pacific Coast—Stocks Large

MANY orders of small size continue to be the rule on the Pacific Coast, and although the volume is large, the expense ratio is high. Stocks are larger than the present turnover warrants. Prices have been steady for the past fortnight with a ½-cent decline in bare copper-wire base and rumored reductions on certain cords and tapes. Lamp sales are showing the seasonal acceleration, and a banner year is expected from the effect of a sales drive with a better stock turnover in view. Electric range campaigns being conducted in the Northwest territory of the Pacific Coast are expected to conclude about the fifteenth with a volume in excess expectations.

Retail business is better, though probably somewhat below that of last year. The Southern Pacific Company has recently ordered some selector and telephone dispatching equipment. An order from a central-station company for 25,000 locust pins is reported, but the last week's business has been largely routine and maintenance. Among the new buildings announced is the new million-dollar Del Monte hotel for San Francisco, replacing the historic structure recently destroyed by fire. The fourth annual California Industries Exhibition is announced for October 18 to November 1, and the electrical fraternity is striving to make its palace of electricity the outstanding feature. Building permits for September issued in California show in general an increase for the northern and central parts of the state and a decline for southern California as compared with the same month last year.

Activities of the Trade

Buffalo Fuse Corporation Reorganized

Announcement has been made of a complete reorganization of the Buffalo Fuse Corporation, with the transfer of all existing stock to new owners. The new officers are Robert F. Bickford, president; Robert B. Harris, vice-president; Edward L. Jellinck, secretary, and Frank R. Collins, treasurer.

The company will manufacture a new type of the "Pierce" fuse. John G. Clemens, inventor of the Pierce fuse, will be superintendent of the plant of the Buffalo Fuse Corporation. The Chicago laboratories of the National Board of Fire Underwriters approved the new Pierce fuse last February, covering the complete 250-volt line up to 600 amp., which covers 85 per cent of the company's products.

Federal Trade Commission Reports on Domestic Appliances

A report has just been sent to the Senate by the Federal Trade Commission the outstanding features of which are the control exercised by patent pools among manufacturers of washing machines, the shutting out of new competition in the vacuum-cleaner industry, the questionable competitive tactics of the leading manufacturer of aluminum cooking utensils, which is affiliated with the Aluminum Company of America, the monopolistic position of the latter company, which has apparently engaged in various practices forbidden by a judicial decree under the Sherman act, the dominating position of the Singer Company in the sewing machine industry, the efforts of trade associations in the refrigerator and broom industries to enhance the prices of their products, and the competitive methods of retail dealers in kitchen utensils and domestic appliances.

Reliance Electric Receives Orders for Anti-Friction Bearing Motors

The Reliance Electric & Engineering Company, Cleveland, has recently made several interesting and important sales of anti-friction bearing motors. To the Gary Tube Company, Gary, Ind., it has sold 100 5-hp. to 7½-hp. ball-bearing alternating-current motors equipped with Fafnir or SKF ball bearings. (These two are the standard ball bearings used by the Reliance company.) The company has also sold twenty-six 7½-hp., 300-1,200-r.p.m. direct-current adjustable-speed interpole motors equipped as follows: Three with Hyatt roller bearings, three with Rollway roller bearings, ten with SKF ball bearings, nine with Fafnir ball bearings and one with standard sleeve bearings. All of these twenty-six will be applied to the same job of socket tapping or pipe threading, which is thought to be the first attempt to put different classes of bearings in the same plant under the same service.

In addition thirty 5-hp. totally inclosed 400-1,200-r.p.m. direct-current adjustable-speed motors equipped with SKF or Fafnir ball bearings have been sold to the Edgar Thomson Works, Carnegie Steel Works, Homewood, Pa. These motors will be used on stokers and are built with the navy water-tight type of inclosure in order to get absolute protection against coal-dust. Another order recently obtained by the company is for approximately 100 motors for all of the manual training machinery in the Crane Technical High School, Chicago, costing around $40,000.

Superior Gas Engine Acquires Control of German Diesel Plant

The Superior Gas Engine Company, Springfield, Ohio, has acquired a controlling interest in the Diesel Gas Engine Works, Cologne, Germany. Under the merger the Superior company will acquire all rights for the manufacture and sale of Diesel engines in the United States, Canada and all insular possessions. The Superior company has also purchased the property of the Otto Engine Works of Philadelphia.

Patent Suit Filed Against the Westinghouse Company

The Automatic Reclosing Circuit Breaker Company, Columbus, Ohio, has brought suit in the United States District Court for the Western District of Pennsylvania against the Westinghouse Electric & Manufacturing Company. In its bill of complaint the automatic company alleges that the defendant has infringed basic claims of its patents, Nos. 13,856, 1,312,454 and 1,363,814, relating to automatic reclosing circuit breakers, and asks the court to enjoin the Westinghouse company from further infringement.

The Western Electric Sign Company, Inc., 535 Central Building, Seattle, has been organized by James C. Zancker, for eight years Northwest manager for the Federal Electric Company of Chicago, and Carl E. Nord, formerly head of the Nord Company, sign manufacturer.

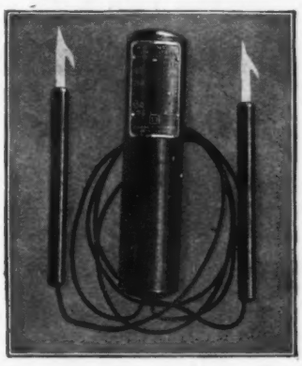
The S. B. Condit, Jr., Company, manufacturers' agent, has moved its warehouse from 233 Congress Street to 114 Pearl Street, Boston, with an increase of more than 50 per cent in floor space. Recently the company has become a distributor for the Wireless Dry Cells, Ltd., Niagara Falls, N. Y.

The Pacific Electric Manufacturing Company, manufacturer of high-tension switches and other electrical equipment, 827 Folsom Street, San Francisco, has tentative plans under way for the erection of a new two-story factory building, to cost $50,000.

New Equipment Available

Voltage Tester

A new type of voltage tester which will indicate whether the current is alternating or direct as well as measure the voltage up to 550 volts has been placed on the market by the Square D Company, Detroit. This voltage tester, which is known as the "Wigginton," is inclosed in a rugged fiber housing as shown, and does not require the use of lamps. It consists of a magnet coil which operates a plunger against the tension of a spiral spring. The position of the plunger indicates the actual voltage on a plainly marked scale. Long-lead wires with fiber-insulated handles are provided with pointed hooks to make it easy to get the lead wires into the circuit.



VOLTAGE TESTER, WHICH DOES NOT REQUIRE THE USE OF LAMPS

High-Pressure Steam Trap

A new steam trap designed for extreme pressure and temperature has been placed on the market by the Armstrong Machine Works, Three Rivers, Mich. The trap embodies the same patented basic operating principle that has been established in the standard Armstrong trap. The body and cap are of the highest grade of cast steel, having a tensile strength of approximately 70,000 lb. All strains are removed from the castings by annealing.

The valve parts, of non-corrosive chrome steel machined from bar stock and then heat-treated, have been made particularly rugged to withstand the service conditions imposed by high pressure and superheat. They are furnished with orifices suitable for pressures up to 600 lb., or higher in special cases. The trap is hydraulically tested to pressures up to 3,000 lb. It is also made for pulsating pressure service.

New Trade Literature

INSULATION FOR POWER PLANTS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a bulletin, known as circular No. 1,686, in which it deals with the use of "Micarta" in the central station and substation. It describes the applications in which it may be employed and gives the electrical and mechanical properties of the different grades of "Micarta."

CONTROLLING DEVICES.—The Industrial Controller Company, Milwaukee, Wis., is distributing bulletins Nos. 2,400B, 8,517B and 9,000B, describing its motor-circuit switch with test jack, alternating-current magnetic contactor, and alternating-current-direct-current automatic-control push-button stations respectively.

INDOOR BUS SUPPORTS.—The Champion Switch Company, Buffalo, is distributing bulletin B, which contains a complete price list, dimensions and illustrations of its various types of indoor bus supports.

ELECTRIC FANS,—Catalog No. 490-B issued by the Buffalo Forge Company, Buffalo, describes and illustrates the "Buffalo" electric fans for blowing, exhausting, ventilating, cooling, drying, etc.

MOTOR DRIVEN EXHAUST FANS.—The Diehl Manufacturing Company, Elizabeth, N. J., has issued bulletin No. 1,650, covering the "Diehl" motor-driven exhaust fans for both direct and alternating current.

PORTABLE AIR COMPRESSORS, ETC.—The Ingersoll-Rand Company, 11 Broadway, New York City, has issued a seventy-two-page booklet entitled "100 and 1 Ways to Save Money with Portable Air Power," which describes its portable air compressors and the many air tools and labor-aiding methods made possible by them. It contains over one hundred illustrations showing various applications of its portable air compressors.

MECHANICAL OIL-BURNING SYSTEM—The Simplex Fuel Oil Engineering Company, Inc., 11 Broadway, New York City, has issued a bulletin describing the "Simplex" mechanical oil-burning system. It contains a table on fuel-oil data and capacity of burner-tip installations.

CLINKER-PROOF BLOCKS — The Bernitz Furnace Appliance Company, 177 State Street, Boston, has issued bulletins B-2 and W. G., covering the "Bernitz" clinker-proof super blocks, which are particularly adapted to underfeed and chain-grate stokered furnaces, and the "Bernitz" super blocks for water-gas generators respectively.

HYDRAULIC REGULATING GATES.—The Whiting Corporation, Harvey, Ill., is distributing a circular containing several illustrations showing various installations of its hydraulic regulating gates.

TRANSFORMERS FOR INDUSTRIAL USES.—Bulletin No. 1,030 issued by the American Transformer Company, Newark, N. J., calls attention to its various transformers for industrial purposes.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Purchase is desired in Kovno, Lithuania (No. 11,858), of pocket flashlamps; (No. 11,859) for light bulbs, wiring accessories, electric wire and radio sets.

Purchase is desired in Wellington, New Zealand (No. 11,793), of materials for the manufacture of electric light bulbs, machinery for making electric light bulbs, vacuum pumps and special equipment.

An agency is desired in Melbourne, Australia (No. 11,857), for radio sets and parts.

An agency is desired in Lausanne, Switzerland (No. 11,860), for telephonic apparatus, especially automatic telephones.

An agency is desired in Bombay, India (No. 11,828), for power-driven and household coffee machines, refrigerating machines and household refrigerating plants.

Purchase is desired in Hamburg, Germany (No. 11,798), for copper, zinc, lead, etc.

Purchase and agency is desired in Melbourne, Australia (No. 11,809), for phonograph motors, high-grade spring and electric, and parts and records.

SWITCHGEAR FOR THE WAIKATO (NEW ZEALAND) POWER SCHEME. — Tenders will be received by the Public Works Department, Wellington, New Zealand, until Nov. 18, for switchgear for the Ngongotata substation of the Waikato power scheme.

STREET-LIGHTING FITTINGS FOR CAPE TOWN, SOUTH AFRICA.—The City Council will receive tenders until Oct. 29 for 500 or 1000 street-lighting fittings, each consisting of reflector, lamp-holder pipe, finial, porcelain insulators, lock-nuts, etc.

LUBRICATING OILS FOR MONTEVIDEO, URUGUAY.—Tenders will be received by the State Electric Works of Montevideo, Uruguay, until Nov. 19 for 30,500 kegs of lubricating oils.

LIGHTING STORAGE AND SWITCH-OPERATING BATTERIES FOR NEW SOUTH WALES (AUSTRALIA) GOVERNMENT RAILWAYS AND TRAMWAYS.—Tenders will be received by the New South Wales Government Railways and Tramways, Sydney, Australia, until Nov. 19 for switch-operating and lighting batteries.

POWER STATION FOR BEAUFORT WEST, SOUTH AFRICA.—Tenders will be received by the Town Council of Beaufort West, South Africa, until Oct. 31 for power-station plant in connection with an electric lighting scheme.

New Incorporations

THE BUTLER (KY.) UTILITIES COMPANY has been incorporated with a capital stock of $10,000 by H. N. Owen, H. E. Gucker and C. D. Peoples.

THE COMAL POWER COMPANY, San Antonio, Tex., has been organized with a capital stock of $1,000 by W. B. Tuttle, E. H. Keifer and W. P. Nepier.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

DOVER, N. H.—The Twin State Gas & Electric Company has been authorized to proceed with the erection of a high-tension transmission line from its power plant on Cocheco Street through the Dover Point section to Newington, where it will connect with the lines of the Portsmouth Power Company.

RUTLAND, MASS.—Bids will be received by the United States Veterans' Bureau, Room 791 Arlington Building, Washington, D. C., until Oct. 21 for construction of additions to attendants' quarters, infirmary building, mess and kitchen building, officers' quarters, boiler house and bunkers, semi-ambulant building, recreation building and garage, etc., at Rutland. Separate bids will be received for building construction, plumbing, heating, electrical work and concrete smokestacks. Frank T. Hines is contractor.

WORCESTER, MASS.—The Morgan Construction Company, manufacturer of wire-drawing machinery, etc., contemplates the installation of electric power equipment, electric cranes, etc., in its proposed addition, to cost about $100,000.

NEW MILFORD, CONN.—The property of the New Milford Electric Light Company, which supplies electricity in New Milford, Bridgewater and part of Washington, has been acquired by interests identified with the Connecticut Light & Power Company, Waterbury.

Middle Atlantic States

BROOKLYN, N. Y.—The Brooklyn Edison Company, Inc., has started work on the construction of a new alternating-current substation at Johnson and Pearl Streets.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 14, for 3,000 flashlights, without battery, for the South Brooklyn Navy Yard. (Schedule 2740.)

BROOKLYN, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education, corner of Flatbush Avenue Extension and Concord Street, Brooklyn, until Oct. 21 for electric wiring and fittings and gas and electric fixtures for addition to Public School 128 at the corner of Eighty-fourth Street and Twenty-first Avenue.

BUFFALO, N. Y.—Bids will be received by the Department of Public Safety until Oct. 13 for furnishing and installing electric traffic signal system.

DURHAM, N. Y.—The Upper Hudson Electric & Railroad Company, Catskill, contemplates extending its transmission lines in Durham to East Durham, a distance of 3½ miles, and from Greenville to Freehold, about 4 miles.

ELLICOTTVILLE, N. Y.—The Ellicottville Electric Light Company has applied for permission to extend its lines in the towns of Ellicottville and Great Valley, a distance of about 5 miles. It also plans to extend its lines in another direction to serve the residents of Washington Street, who are now outside of the corporate limits of the town.

GENEVA, N. Y.—The Empire Gas & Electric Company has applied for permission to extend its transmission lines from Seneca Falls to Fayette and Varick, a distance of 8 miles to furnish service in those towns. The cost is estimated at $20,000.

NEW YORK, N. Y.—Plans have been filed by the New York Edison Company for the erection of a power house at 801 East Fourteenth Street, to cost about $3,500,000. Thomas E. Murray, Inc., is architect.

NEW YORK, N. Y.—The Star Company, 2 Columbus Circle, plans to install electric power equipment at its proposed paper storage and distributing plant to be erected at Fifty-fourth and Fifty-fifth Streets, Eleventh and Twelfth Avenues, to cost about $500,000.

ALLENTOWN, PA. — Officials of the Pennsylvania Power & Light Company are forming two new subsidiaries, to be known as the Middle Smithfield-Monroe Power & Light Company and the Hamilton-Monroe Power & Light Company, to construct and operate transmission lines in Middle Smithfield and Hamilton Townships, respectively.

GREENVILLE, PA.—The Mercer County Light, Heat & Power Company has applied for permission to take over and consolidate eight small companies, with transmission lines in this vicinity. Extensions will be made in the transmission system.

HARRISBURG, PA. — The East Penn Electric Company has applied for permission to take over and consolidate the Rush, Jackson, Jefferson, Wayne and Lykens Township Electric companies. Extensions in transmission lines in these sections are contemplated.

NANTICOKE, PA.—A preliminary permit has been issued to the Luzerne County Gas & Electric Company by the State Water and Power Resources Board for the construction of its proposed steam-operated generating plant, on site near Nanticoke, to cost about $5,000,000.

PHILADELPHIA, PA.—The navy purchasing office has been authorized to purchase an electric heat-treating plant for the local naval aircraft station. (Aero Requisition 747).

ROCKWOOD, PA.—The Borough Council has applied for permission to take over and operate the local plant and system of the Rockwood Electric Company as a municipal enterprise. Extensions and improvements are contemplated.

SELLERSVILLE, PA.—The installation of an ornamental lighting system in the business district is under consideration.

WEISENBURG, PA.—The plant and holdings of the Weisenburg Electric Company, which serves Weisenburg, Maxatawny Township and the villages of Berks and New Tripoli, have been purchased by the Topton (Pa.) Electric Light & Power Company. Plans, it is said, are under way for extensions and improvements.

BALTIMORE, MD.—The United Railways & Electric Company has plans in progress for an automatic power substation at 305-7 Guilford Avenue, to cost about $42,500.

BALTIMORE, MD.—The City Council is considering submitting a proposal to issue

$1,500,000 in bonds for extensions to conduit system for electric wires to the voters at the election to be held in November.

HAMPTON, VA.—The Newport News & Hampton Railway, Gas & Electric Company has been granted a franchise to erect an electric transmission line from Elmwood Lane along the Black River Road to York County.

WASHINGTON, D. C.—Bids will be received by the general purchasing officer, Panama Canal, until Oct. 23, for motors, meters, lamp-post parts, magnet wire, rectifiers, fixtures, switch keys, etc. (Circular 1633.)

North Central States

BELLAIRE, MICH. — Bonds to the amount of $19,500 have been authorized for rebuilding the municipal electric light and power plant, recently destroyed by fire.

HART, MICH.—A special election will be held soon to vote on the proposal to issue $62,000 in bonds to construct a municipal hydro-electric plant.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Oct. 17 for pipe covering for the Division of Light and Power.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, Cleveland, until Oct. 17 for structural steel work for turbine unit No. 6 for the Division of Light and Power.

LORAIN, OHIO.—The Chamber of Commerce and other local civic bodies are urging the immediate installation of the proposed ornamental street-lighting system approved by the City Council several months ago.

ASHLAND, KY.—Steps have been taken by the Chamber of Commerce for extensions and improvements in the street-lighting system.

BUTLER, KY. — The Butler Utilities Company, recently incorporated, has purchased the local plant and plans to develop about 150 hp. C. E. Record, engineer, is in charge.

ELKHART, IND.—The New York Central Lines, Western Division, Chicago, Ill., is said to be planning the construction of a power plant in connection with its proposed local freight yard and shops on a 400-acre tract. The entire project will cost about $6,500,000.

FORT WAYNE, IND. — The Indiana Service Corporation has been authorized to issue $460,000 in bonds, the proceeds to be used for improvements and extensions.

GARY, IND.—The Calumet Gas & Electric Company has applied for permission to take over and merge fourteen electric light and power companies operating in Northern Indiana. A number of transmission line extensions are planned.

BONDUEL, WIS.—The Badger Utility Company, Pulaski, it is reported, contemplates the construction of a local 33,000,-volt substation, to cost about $75,000.

CASSVILLE, WIS.—The village officials are negotiating with the Interstate Light & Power Company with a view of connecting with the transmission line of the company from Bloomington, a distance of 14 miles, to secure electricity for the local municipal electric plant. It is proposed to establish a twenty-four-hour service.

MILWAUKEE, WIS. — Permission has been granted the Milwaukee Electric Railway & Light Company to build a cross-town electric railway from the Northwestern railroad tracks to the Lakeside power plant of the electric company.

RACINE, WIS.—Plans are being considered by the Wisconsin Gas & Electric Company for the erection of a large substation, which will receive electricity over a high-tension line, now being erected from the Lakeside power plant of the Milwaukee Electric Railway & Light Company, for local distribution.

TRACY, MINN.—The Northern States Power Company contemplates an addition to its local power plant, recently acquired from the Citizens' Light & Power Company, to cost about $60,000.

WACONIA, MINN.—The City Council has rejected all bids submitted for the construction of a municipal electric light plant. New bids, it is understood, will be called at an early date.

SAC CITY, IOWA.—A movement has been started to have the town purchase the distributing system of the Iowa Light, Heat & Power Company, to be owned and operated by the municipality.

AURORA, MO.—Bids, it is reported, will soon be asked by the Lawrence County Water, Light & Cold Storage Company for a 500-kw. steam-driven electric generating plant in Aurora, the erection of an 8-mile transmission line (three wire, No. 8 copper wire) from Billings to Republic, and 5 miles of distribution circuits in Republic. The cost is estimated at $200,000. S. Merkle, Aurora, is engineer.

CAPE, GIRARDEAU, MO.—The Community Power & Light Company, 408 Pine Street, St. Louis, it is reported, contemplates the construction of a central steam-driven electric generating plant on the Mississippi River in Cape Girardeau district for the Missouri Public Utilities Company, with transmission lines, etc., to cost about $2,000,000.

CENTERTOWN, MO.—The Public Service Company has secured a franchise and will extend its transmission line here. A local commercial system will be installed.

HARTVILLE, MO.—Bids will soon be asked by the City Council for equipment for its proposed hydro-electric plant, consisting of one 42-kva. water turbine, electric alternator, 25-hp. oil engine, switchboard and auxiliary equipment. The Alexander Engineering Company, Woodruff Building, Springfield, is engineer.

ST. LOUIS, MO.—Preliminary plans are being prepared by the trustees of Washington University for the construction of a power plant, equipment, etc., and a 175-ft. brick stack, to cost about $250,000.

OBERT, NEB.—A special election will soon be held to vote on the proposal to issue $10,000 in bonds for a municipal electric light system.

POTTER, NEB.—The power plant of the Farmers' Union Trading Company has been acquired by the city and will be operated as a municipal enterprise. Extensions, it is reported, are contemplated.

Southern States

GREENSBORO, N. C.—Bids will be received by the Board of Town Commissioners until Oct. 14 for transformers and switchboards for the hydro-electric development. Specification may be obtained from W. L. Thacker, 224 North Edgeworth Street, Greensboro.

MOORESBORO, N. C.—The town officials are considering an issue of $12,000 in bonds for an electric light plant.

COLUMBIA, S. C.—The proposed 20,000-hp. steam power plant to be erected on the Broad River, between Spartanburg and Columbia, by the W. S. Barstow Company, at a cost of about $2,000,000, will be located at Parr Shoals. The company now has a hydro-electric plant there.

COLUMBUS, GA.—The Columbus Electric & Power Company has tentative plans for the installation of an underground conduit system in a number of streets in the business district, to cost about $50,000.

CHIPLEY, FLA.—Work has started on the construction of the new power station of the Chipley Light & Power Company. The plans provide for a cold-storage department.

MARTIN, TENN.—The Kentucky-Tennessee Light & Power Company contemplates installing a 1,000-kw. steam turbo-generator in its local plant.

PORTLAND, TENN.—The Portland Electric Company has applied to the Public Utilities Commission for approval of the sale of its property to the Davidson Light & Power Company, Springfield. The transmission lines of the Davidson company now extend to Orlinda, near Portland.

FLORENCE, ALA.—Bids will be received at the United States Engineer Office, Florence, until Oct. 15, for furnishing and installing three electric elevators for the power house of Wilson Dam, on the Tennessee River.

TUSCALOOSA, ALA.—The installation of an ornamental lighting system in the business district is under consideration. The plans provide for seventy-three standards.

MARKS, MISS.—The Council is considering an issue of $35,000 in bonds for the construction of a water and light plant.

BLYTHEVILLE, ARK.—The Arkansas-Missouri Power Company has applied for permission to increase its capital from $200,000 to $1,000,000, part of the proceeds to be used for extensions and betterments.

PINE BLUFF, ARK. — The Arkansas Light & Power Company is arranging for a bond issue of $1,500,000, the proceeds to be used for extensions and improvements.

WESTLAKE, LA.—The Lake Charles Electric Company has authorized the construction of a transmission line on the Old Spanish Trail Highway to Sulphur.

MORRISON, OKLA. — Plans are being prepared for the construction of a municipal electric plant, in conjunction with a proposed waterworks station. H. G. Olmsted & Company, 2230 West Eighteenth Street, Oklahoma City, are engineers.

WEWOKA, OKLA.—The Oklahoma Gas & Electric Company plans to construct a substation in Wewoka.

BROWNWOOD, TEX.—The Texas Power & Light Company has authorized surveys for extensions in its 60,000-volt transmission line to the west boundary line of Brown County.

DECATUR, TEX.—The Texas Power & Light Company is negotiating for the purchase of the municipal electric light plant. It plans to close down the station and furnish service from the 66,000-volt transmission line in this district. A local substation will be built.

PLAINVIEW, TEX.—The Texas Utilities Company is planning to install a 750-hp. engine in its local plant.

Pacific and Mountain States

SEATTLE, WASH.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 21, for one electrically driven hoist, with spare parts, for the Puget Sound Navy Yard. (Schedule 2718.)

KLAMATH FALLS, ORE.—The Oregon, California & Eastern Railway Company has applied for permission to extend its transmission system in different parts of the county.

ROSEBURG, ORE.—The California-Oregon Power Company has made application for permission to use waters from Clear Water Creek, Douglas County, for a hydro-electric power development, with initial output of about 14,000 hp.

THE DALLES, ORE. — Malcolm A. Moody and associates have applied for permission to use water from the Deschutes River for a proposed hydro-electric development, the initial installation to cost about $150,000.

LOS ANGELES, CAL.—The City Council is considering ordinances providing for the installation of ornamental lighting systems on June Street and on Santa Monica Boulevard. The first noted will consist of concrete standards and the latter of cast-iron standards.

WESTWOOD, CAL. — The Red River Lumber Company, engineering department, plans to build a 60,000-volt transmission line to Hat Creek.

BONNERS FERRY, IDAHO.—The Cyanide Gold Mining Company has applied for permission to construct and operate a hydro-electric power plant on Davis Creek for mining service. It will have an initial output of about 775 hp. The project will include a transmission line.

NAMPA, IDAHO.—The Pacific Fruit Express Company, 65 Market Street, San Francisco, contemplates the construction of a power house in connection with its proposed local refrigerator car shops, to cost about $450,000.

OGDEN, UTAH.—Steps have been taken by the Chamber of Commerce to secure a new street-lighting system in the principal business streets.

GLOBE, ARIZ.—The Globe Light & Power Company has been granted permission to extend its transmission line to Midland City and Claypool and to furnish electrical service in both places.

FORT BAYARD, N. M.—Bids will be received by the United States Veterans' Bureau, Washington, D. C., until Oct. 15, for a radio receiving and distributing system for the local hospital.

Canada

AMHERSTBURG, ONT.—At an election to be held Oct. 20 the bylaw authorizing the purchase of the local Hydro-Electric system, at a cost of $32,000, will be submitted to the ratepayers.

JONES FALLS, ONT. — The Hydro-Electric Power Commission of Ontario contemplates a 2,500-hp. development on Rideau Canal at Jones Falls.

QUEBEC, QUE.—The Southern Canada Power Company has petitioned the Public Service Commission for permission to extend its transmission line from Cowansville to Dunham.

Electrical Patents

Announced by U. S. Patent Office

(Issued August 26, 1924)

1,506,445. SEGREGATED DRIVE FOR PAPER MACHINES AND THE LIKE; H. W. Rogers, Schenectady, N. Y. App. filed Feb. 28, 1921. Where the driven elements are normally required to operate in fixed speed relation.

1,506,446. SYSTEM OF MOTOR CONTROL; H. W. Rogers, Schenectady, N. Y. App. filed May 12, 1922. In which a plurality of driven elements are normally required to operate in fixed speed relation.

1,506,450. ELECTRICAL MULTI-WIRE SYSTEM; P. Schade, Hermsdorf, near Berlin, Germany. App. filed May 3, 1922. With means for localizing the effect of a fault.

1,506,453. SEGREGATED DRIVE FOR PAPER MACHINES AND THE LIKE; C. W. Shaifer, Schenectady, N. Y. App. filed Feb. 28, 1921. In which a plurality of driven elements are normally required to operate in fixed relation.

1,506,466. TERMINAL-POST SEAL; W. Walter, Indianapolis, Ind. App. filed Sept. 15, 1921. For storage batteries.

1,506,467. BURGLAR ALARM; H. E. Watson, Arnolds Park, Iowa. App. filed Oct. 28, 1920.

1,506,468. ELECTRON DISCHARGE DEVICE; W. C. White, Schenectady, N. Y. App. filed Oct. 28, 1920. "Soft valve" detector for radio signals.

1,506,471. ELECTRIC BATTERY LAMP OR LANTERN; G. A. H. Wootton, London, England. App. filed Nov. 8, 1923.

1,506,486. ELECTRIC OSCILLATOR; A. W. Hull, Schenectady, N. Y. App. filed March 1, 1920. Of the pliotron type.

1,506,487. MEANS FOR LOCKING ELECTRIC LIGHT GLOBE ATTACHMENTS TO HOLDERS; E. W. Hutchings, Miramar, Wellington, New Zealand. App. filed Sept. 14, 1922.

1,506,527. TROLLEY RETRIEVER; A. J. Houle, Holyoke, Mass. App. filed Jan. 22, 1924. Automatic.

1,506,537. PROCESS OF PURIFYING GRAPHITE; M. Langheinrich, Munich, Germany. App. filed Aug. 24, 1921.

1,506,552. RESISTANCE METER; D. J. Angus, Indianapolis, Ind. App. filed May 14, 1921. To measure electrical resistance directly.

1,506,561. SEPARATOR FOR STORAGE BATTERIES; E. G. Burton, Columbia, Tenn. App. filed March 27, 1923. Strip form.

1,506,569. MAGNETO-ELECTRIC GENERATOR; H. G. Cox, Chicago, Ill. App. filed Sept. 9, 1921. Especially for use in connection with internal-combustion-engine ignition.

1,506,580. QUICK-ACTING AMPLIFYING BREAK KEY FOR WIRELESS TELEGRAPHY; H. E. Hallborg, Norfolk, Va. App. filed Oct. 25, 1920.

1,506,671. ELECTRICAL CABLE SOCKET OR LUG; E. Scharpenberg, Wetter-on-the-Ruhr, Germany. App. filed Dec. 22, 1920. Having two sleeves with clamping projections.

1,506,676. WATER HEATER; J. Shahan, Gadsden, Ala. App. filed Jan. 12, 1924. Electrically heated water bath used in bacteriological and serological work.

1,506,695. INTERNAL-COMBUSTION-ENGINE FUEL HEATER; J. D. Tyler, Clarksville, Tenn. App. filed March 9, 1923.

1,506,698. COMBINED SPOT OR BUTT AND ARC WELDER; C. B. Waters, Montclair, N. J. App. filed Feb. 4, 1924. Transformer arrangement.

(Issued Sept. 2, 1924)

1,506,734. COMMUTATOR BRUSH; W. S. Click, Turtle Creek, Pa. App. filed Oct. 29, 1920. Means for attaching pigtail.

1,506,735. COIN-COLLECT SYSTEM FOR AUTOMATIC TELEPHONE EXCHANGES; R. D. Conway, Chatham, N. J., and R. L. Quass, Hawthorne, N. J. App. filed Aug. 26, 1920.

1,506,736. SIGNALING SYSTEM; L. Dorfman, Wilkinsburg, Pa. App. filed Aug. 5, 1921. Sending system coupled to a continuous-wave source of radio-frequency current.

1,506,740. BRUSH-HOLDER SPRING; G. M. Eaton, Pittsburgh, Pa. App. filed May 24, 1921. With means for securing a brush shunt to the finger spring.

1,506,742. MODULATING SYSTEM; C. Le G. Fortescue, Pittsburgh, Pa. App. filed June 25, 1921. For controlling current of radio frequency and the input to an antenna system.

1,506,743. TELEPHONE-EXCHANGE SYSTEM; J. W. Gooderham, New York, N. Y. App. filed Oct. 16, 1920. Mechanical switching.

1,506,744. FLOATING CONTACT TERMINAL; L. J. Greenawalt, Mansfield, Ohio. App. filed June 30, 1921. For electric stove.

1,506,746. FIELD-COIL INSULATING SHIELD; I. L. Griffith, Wilkinsburg, Pa. App. filed Nov. 12, 1920. For machines of the salient-pole type.

1,506,747. TELEPHONE-EXCHANGE SYSTEM; J. A. Hall, Bayside, N. Y. App. filed Oct. 1, 1919. Machine switching.

1,506,749, 1,506,750. OVERLOAD PROTECTION FOR GENERATORS; R. E. Hellmund, Swissvale, Pa. App. filed Dec. 10, 1919. High-voltage, direct-current generators as used on railway systems.

1,506,751. LIQUID RHEOSTAT; R. E. Hellmund, Swissvale, Pa. App. filed June 15, 1921. Such as are used in railway motor-control systems.

1,506,753. SUPPORT FOR ROTOR WINDINGS; S. C. Hoey, Wilkinsburg, Pa. App. filed May 14, 1921. Of squirrel-cage motors.

1,506,754. MOTOR CONTROL SYSTEM; W. M. Hutchinson, Wilkinsburg, Pa. App. filed Sept. 8, 1921. For governing a plurality of motors that may be energized from several different sources of electrical energy to drive a railway vehicle.

1,506,756. COMPOSITE MOLDED STRUCTURE; W. H. Kempton, Wilkinsburg, Pa. App. filed June 28, 1918. Wherein insulated conducting bodies are held in spaced relation by means of molded insulating material.

1,506,757. CONTROL SYSTEM; E. S. Lammers, Jr., Elyria, Ohio. App. filed May 7, 1919. For controlling electric motors which are employed for operating the bells of blast furnaces.

1,506,758. FURNACE REGULATOR SYSTEM; G. M. Little, Pittsburgh, Pa. App. filed Oct. 29, 1920. For governing the operation of electric furnaces.

1,506,759. TELEPHONE SYSTEM; A. E. Lundell, Chicago, Ill. App. filed Nov. 1, 1919. Of the manual type using automatic switching for "night service."

1,506,760. CALLING DEVICE; N. H. Lysons, Montreal, Quebec, Canada. App. filed May 24, 1922. Impulse transmitter employed in automatic and semi-automatic telephone systems for the purpose of controlling the operating of switching mechanism.

1,506,761. PROCESS AND APPARATUS FOR TESTING DIELECTRIC MATERIALS; B. MacPherson, Roxbury, Mass. App. filed Sept. 2, 1920.

1,506,763. FIELD-COIL COLLAR; E. Mattman, Wilkinsburg, Pa. App. filed Dec. 31, 1919. For alternating-current rotating field magnet.

1,506,765. SYSTEM FOR CONTROLLING THE SPEED OF DYNAMO-ELECTRIC MACHINERY; F. W. Merrill, East Orange, N. J. App. filed May 27, 1921.

1,506,770. PHASE-MODIFYING SYSTEM; S. G. Nottage, Murraysville, Pa. App. filed May 23, 1919. Adapted for operation with single-phase apparatus.

1,506,777. SECTION INSULATOR; W. Schaake, Pittsburgh, Pa. App. filed Sept. 17, 1920. For sectionalizing an overhead trolley-conductor system.

1,506,781. VARIABLE LEAKY CONDENSER; J. E. Shrader, Edgewood, Pa. App. filed Aug. 18, 1921. For use in wireless telegraphy and telephony.

1,506,792. ELECTRICAL TESTING INSTRUMENT; C. W. Terry, Detroit, Mich. App. filed April 1, 1920. For use in testing and detecting trouble in different portions of electric systems on motor vehicles.

1,506,799. WIRELESS TUNING SYSTEM; P. E. Wiggin, Wilkinsburg, Pa. App. filed July 9, 1921. Regenerative.

1,506,812. ELECTRIC HEATER; J. W. Brown, Jr., Philadelphia, Pa. App. filed March 24, 1923. Resistance type.

1,506,852. HIGH-RESISTANCE CONDUCTOR AND METHOD OF MAKING THE SAME; M. Morrison, New York, N. Y. App. filed April 27, 1922. By depositing a film of material of filamentary form in a predetermined restricted path which may take the form of a helix adherent to the surface of a non-conducting material.

1,506,863. SUSPENSION INSULATOR; B. A. Plimpton, Victor, N. Y. App. filed Aug. 26, 1918. With special means for attaching insulator body.

1,506,864. TELEPHONE-EXCHANGE SYSTEM; L. Polinkowsky, New York, N. Y. App. filed May 5, 1919. Machine switching.

1,506,874. STORAGE BATTERY; T. A. Willard, Cleveland Heights, Ohio. App. filed May 17, 1922. Multi-cell for radio work.

1,506,884. TELEPHONE-EXCHANGE SYSTEM; W. W. Carpenter, Brooklyn, N. Y. App. filed July 11, 1919. Switching means therefor.

1,506,895. ELECTRICAL MEASURING METHOD AND MEANS; F. E. Field, Somerville, N. J. App. filed April 15, 1922. For determining the transmission loss of electrical apparatus to be connected between circuits of different impedances.

1,506,896. TESTING METHOD AND SYSTEM; F. E. Field, Somerville, N. J. For measuring the voltage ratio or amplification of vacuum-tube input transformers.

1,506,899. TELEPHONE SYSTEM; C. L. Goodrum, New York, N. Y. App. filed April 20, 1920. For automatically connecting a calling line to an idle trunk.

1,506,901. TELEPHONE-EXCHANGE SYSTEM; J. A. Hall, Bayside, N. Y. App. filed April 17, 1920. For automatically connecting a calling line to an idle trunk.

1,506,909. ELECTRIC GRILL; F. L. Kohlhase, Chicago, Ill. App. filed Oct. 23, 1923. Table stove.

1,506,912, 1,506,913. TELEPHONE SYSTEM; H. D. MacPherson, Summit, N. J. App. filed Aug. 15, 1921. Where signals for a plurality of toll lines extending between widely separated offices are transmitted over signaling paths common to said toll lines.

1,506,933. TELEPHONE SYSTEM; L. D. Kellogg, Deerfield, Ill. App. filed Oct. 24, 1919. Automatic or semi-automatic, in which switches are used for connecting a calling line to an idle trunk.

1,506,938. ELECTRICALLY OPERATED OIL CUP; R. R. McClure, San Francisco, Cal. App. filed Aug. 2, 1920. Capable of discharging a small quantity of oil whenever desired.

1,506,944. BATTERY PLATE; C. C. Rich, Mount Vernon, N. Y. App. filed Sept. 13, 1922. Lead type, arranged to permit expansion and contraction.

1,506,962. THERMO-ELECTRIC APPARATUS; F. W. Andrews, Wapakoneta, Ohio. App. filed May 14, 1917. Thermocouple group.

1,506,999. PROCESS OF PREPARING MATERIAL FOR AND PRODUCING THEREFROM NITRIFIED MATERIAL; J. H. Reid, Readsboro, Vt. App. filed Dec. 16, 1920.

1,507,000. AUTOMATIC TELEPHONE EXCHANGE; J. G. Roberts, Chicago, Ill. App. filed March 10, 1906.

1,507,005. ELECTRIC HEATER; D. E. Shaw and H. N. Shaw, Milwaukee, Wis. App. filed Dec. 29, 1920. In which a current is caused to flow in a container or other object to be heated to raise its temperature.

1,507,006. MAGNETIC CHUCK; F. L. Simmons, Woonsocket, R. I. App. filed Oct. 28, 1918.

1,507,016. RADIO-SIGNALING SYSTEM; Le De Forest, New York, N. Y. App. filed Sept. 23, 1915.

1,507,017. WIRELESS TELEGRAPH AND TELEPHONE SYSTEM; L. De Forest, New York, N. Y. App. filed March 20, 1914. For duplex operation.

1,507,021. RHEOSTAT; J. H. Miller, Oak Park, Ill. App. filed April 28, 1922. Of the type used in radio.

1,507,023. HANGER FOR TROLLEY WIRES AND THE LIKE; W. G. Milne, Hamilton, Ontario, Canada. App. filed June 9, 1924.

1,507,075. WIRE CHIEF'S TEST CIRCUIT FOR TELEPHONE SYSTEMS; C. E. Lomax, Chicago, Ill. App. filed May 18, 1921.

1,507,076. PROCESS FOR PREPARING WOODEN STORAGE-BATTERY SEPARATORS; A. H. Luhrman, Cincinnati, Ohio. App. filed Nov. 16, 1921. So that they may be stored and shipped in a dry state.

1,507,081. TELEPHONE TRANSMITTER; B. F. Miessner, New York, N. Y. App. filed March 12, 1919. For telephoning in or from airplanes, where the noise of the engines interferes seriously with the operation of ordinary telephone transmitters.

1,507,082. VANITY CASE; S. E. Miller, Chicago, Ill. App. filed Feb. 21, 1922. Containing a mirror with a lamp.

1,507,086. ELECTRIC LAMP SOCKET; F. Orpen, Toronto, Ontario, Canada. App. filed April 2, 1921.

1,507,113. TELEPHONE-EXCHANGE SYSTEM; J. W. Gooderham, New York, N. Y. App. filed Oct. 16, 1920. Mechanical switching.

1,507,114. POST AND COVER SEALING MEANS; W. E. Gossling, New York, N. Y. App. filed July 30, 1920. For storage battery.

1,507,116. TELEPHONE SYSTEM; E. E. Hinrichsen, New York, N. Y. App. filed July 14, 1920. Subscriber-operated switching means for private branch-exchange working.

1,507,121. ELECTROCHEMICAL TREATMENT OF LIQUIDS; C. P. Landreth, Philadelphia, Pa. App. filed April 6, 1923. As sewage effluents from slaughter houses, etc.

1,507,136. TRANSMISSION SYSTEM; R. I. D. Nicoll, Summit, N. J. App. filed Feb. 20, 1920. Telephonic; employing means for signaling.